



Topic Name	Term	Skills Developed	AQA Specification reference	Other Notes	Next steps/prior learning
<p>Core Principles</p> <p>1. Materials and their working properties 1</p>	<p>YEAR 10 CORE</p>	<p>This section introduces students to the physical properties of materials. It covers material properties generally rather than in relation to specific materials (students will learn how these physical properties relate to each of the main categories of materials in following lessons). Some of this content will already have been taught in KS3.</p> <p><i>Learning objectives</i> Know and understand physical properties of materials such as:</p> <ul style="list-style-type: none"> ● absorbency (resistance to moisture) ● density ● fusibility ● electrical and thermal conductivity. 	<p>3.1.6.2</p>	<ul style="list-style-type: none"> ● ‘Physical properties of materials’ PowerPoint ● Waterproof coat ● Polystyrene foam ● Solder and soldering irons ● Batteries, wires and bulbs and/or buzzers to make circuits with and a range of electrical conductors and insulators ● Metal spoon and wooden spoon ● Physical properties of materials sorting cards (printed for pairs or small groups, cut out and placed in envelopes) ● Textbook Pages 63–65 	<p>Build key words/terminology Into student’s vocab and Annotation.</p>
<p>2. Materials and their working properties</p>		<p>This section introduces students to the working properties of materials. Again, students will learn how these physical properties relate to each of the main categories of materials in lessons on each of the different material categories; lessons focus on definitions for each of the main properties.</p> <p><i>Learning objectives</i></p>	<p>3.1.6.2</p>	<ul style="list-style-type: none"> ● ‘Working properties of materials’ PowerPoint ● ‘Working properties of materials’ worksheets ● A range of materials (30 mm× 30 mm) for hardness testing: aluminium, copper, hardwood, softwood, acrylic, PET, natural fibre (e.g. cotton), synthetic fibre (e.g. silk), paper, corrugated cardboard ● Centre punches 	<p>Material testing (primary Research)</p>



	<p>Know and understand the following working properties of materials:</p> <ul style="list-style-type: none"> ● strength ● hardness ● toughness ● malleability ● ductility ● elasticity. 		<ul style="list-style-type: none"> ● Test tube clamps ● 300 mm long piece of HIPS tube ● Small piece of electric cable ● Elastic band or piece of Lycra ● Textbook Pages 63–65 	
<p>3. Papers and boards</p>	<p>In this section students will learn about the most common papers and boards.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Know the primary sources of materials for producing papers and boards. ● Be able to recognise and characterise different types of papers and boards. <p>Understand how the physical and working properties of a range of paper and board products affect their performance.</p>	3.1.6.1	<ul style="list-style-type: none"> ● ‘Paper and boards’ PowerPoint ● ‘Paper and boards’ worksheets ● Examples of papers – bleed proof marker paper, cartridge paper, grid paper, layout paper, tracing paper ● Examples of boards – corrugated cardboard, duplex board, foil lined board, foam core board, ink jet card, solid white board ● Textbook Pages 46–48 	<p>Paper and boards- Packaging HW task.</p>
<p>4. Natural and manufactured timbers</p>	<p>In this section students will learn about the working properties of natural and manufactured timber.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Explain the different classifications of natural timber. ● Explain the properties and uses of a variety of softwoods. ● Explain the properties and uses of a variety of hardwoods. 	3.1.6.1	<ul style="list-style-type: none"> ● ‘Natural timber and manufacture timber’ PowerPoint ● YouTube clip ‘How it’s made – Timber’: https://youtu.be/SwxinbpQ9B4 ● YouTube clip ‘How it’s made – Plywood’: https://youtu.be/xGnr8ATHHX8?list=PLIF-zAoABDYvlqUzdRuA1dB9aP-0acbDf 	<p>Some prior knowledge of Manufactured boards from Ks3.</p>



		<ul style="list-style-type: none"> ● Explain the different classifications of manufactured timber. ● Explain the properties and uses of a variety of manufactured boards. ● Explain the advantages and disadvantages of using natural and manufactured timber. 		<ul style="list-style-type: none"> ● ‘Natural timber and manufacture timber’ worksheets ● Samples of softwood e.g. pine ● Samples of hardwood e.g. oak, mahogany, beech ● Samples of manufacture timber e.g. plywood, MDF, chipboard ● ‘Natural timber and manufacture timber’ interactive test ● Homework sheet ● Textbook Pages 49–52 	
<p>5. Metals and alloys</p>		<p>In this section students will learn about the working properties of metals and alloys.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Explain the different classifications of metals. ● Explain the properties and uses of a variety of ferrous metals. ● Explain the properties and uses of a variety of non-ferrous metals. ● Define a ferrous and a non-ferrous alloy. ● Explain the properties and uses of a variety of ferrous alloys. ● Explain the properties and uses of a variety of non-ferrous alloys. 	<p>3.1.6.1</p>	<ul style="list-style-type: none"> ● ‘Metals and alloys’ PowerPoint ● ‘Metals and alloys’ worksheet ● Samples of a cast iron e.g. a vice ● Samples of stainless steel e.g. cutlery ● Samples of non-ferrous metals e.g. copper piping, aluminium drinks can ● ‘Metals and alloys’ interactive test ● YouTube clip ‘Ferrous metals’: https://youtu.be/AWK7T9bz0RA ● Homework sheet ● Textbook Pages 53-55 	<p>Use DATA “Materials handling collection” Metals</p>



<p>6. Polymers</p>	<p>In this section students will learn about the working properties of polymers.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none">● Understand the different classifications of polymers.● Explain the properties and uses of a variety of thermoforming polymers.● Explain the properties and uses of a variety of thermosetting polymers.● Understand how additives can alter the mechanical and physical properties of polymers.	<p>3.1.6.1</p>	<ul style="list-style-type: none">● 'Polymers' PowerPoint● 'Polymers' worksheet● Samples of thermoforming polymers (e.g. yoghurt pots, carrier bag)● Samples of thermosetting polymers (e.g. section of a kitchen worktop, kitchen spatula)● 'Polymers' interactive test● Homework sheet● Textbook Pages 56–57	<p>Use DATA “Materials handling collection” Polymers</p>
<p>7. Textiles</p> <p>(rotate specialist teachers within the dept when possible. AD & JP cover TX and JF and JY teaching RM)</p>	<p>In this section students will learn about the main categories and working properties of textiles.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none">● Be able to list the main categories and types of textiles.● Be able to give examples of fibres and fabrics in each category.● Understand the physical and working properties of each category.● Be able to identify products that different fibres/fabrics could be used for.	<p>3.1.6.1</p>	<ul style="list-style-type: none">● 'Textiles' PowerPoint● 'Natural and synthetic fibres' flash cards● 'Natural and synthetic fibres' grid● 'Fibres and fabrics' worksheets● 'Working properties of textiles' quiz● Textbook Pages 58–62	<p>Core principles- Technical Textiles</p>



8. Modern materials		<p>In this section students learn about a range of modern materials and their working properties.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none">● Understand about the invention of new materials such as graphene, metal foams and titanium.● Understand the properties of these materials and why this helps with their selection.● Understand how materials can be altered to specific applications.	3.1.3	<ul style="list-style-type: none">● ‘Modern materials’ PowerPoint● YouTube video on graphene● YouTube video on metal Foams● Textbook Pages 23–25	Link and differentiate from Smart Materials.
9. Smart materials		<p>In this section students will learn about four key smart materials and how they react to the environment around them.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none">● Understand how a smart material works.● Know what thermochromic pigments are and how they work.● Know what photochromic pigments are and how they work.● Know what shape memory alloys are and how they work.	3.1.3	<ul style="list-style-type: none">● ‘Smart materials’ PowerPoint● YouTube video on thermochromic pigment● YouTube video on photochromic pigment● YouTube video on shape memory alloys● ‘Smart materials’ worksheets● School examples of smart materials● Textbook	Use Smart Materials examples- Thermochromic and Polymorph samples.



<p>10. Composites</p>	<p>In this section students will learn about composite materials and how they can improve the properties of the material.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Understand how new materials can be created by combining two or more materials. ● Recognise a range of composite materials. 	<p>3.1.3</p>	<ul style="list-style-type: none"> ● ‘Composites’ PowerPoint ● ‘Composites’ worksheets ● Textbook 	
<p>11. Technical textiles (summer term increased chance of swapping teachers for specialist areas)</p>	<p>This section builds upon lessons on smart and modern materials and focuses on technical textiles. It covers conductive fabrics, fire-resistant fabrics, Kevlar® and microfibres incorporating micro encapsulation.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Explain what is meant by the term technical textiles. ● Explain how conductive fabrics are produced. ● Give examples of uses of fire resistant fabrics and state their properties. ● State the properties of Kevlar® and give example applications. ● Explain how microfibres incorporate micro encapsulation. 	<p>3.1.3</p>	<ul style="list-style-type: none"> ● ‘Technical textiles’ PowerPoint ● YouTube clip ‘Nomex and Kevlar’: https://youtu.be/72vOt3ggiPI ● ‘Technical textiles’ worksheet ● ‘Technical textiles’ interactive quiz ● Textbook Pages 28–29 	<p>Reinforce and build on prior knowledge.</p>



<p>12. New and emerging technologies: industry and enterprise</p>		<p>In this section students will learn about how new and emerging technologies have changed the workplace and business enterprise in the past, present and future.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Understand how new and emerging technologies have impacted on the design and organisation of the workplace (including automation and the use of robotics). ● Understand how new and emerging technologies affect where we work. ● Understand the tools and equipment we use and how it has been affected by technology. <p>Describe enterprise that has developed as a result of business innovation (for example, crowd funding, virtual marketing and retail, co-operatives and fair trade.</p>	<p>3.1.1</p>	<ul style="list-style-type: none"> ● ‘Industry and enterprise’ PowerPoint ● Student worksheet ‘The impact of new and emerging technologies on the workplace’ ● ‘Industry and enterprise’ quiz ● Textbook Pages 2–4 	<p>Students have prior knowledge of fair trade, crowd funding and virtual marketing etc.</p>
<p>13. New and emerging technologies: people, culture and society</p>		<p>In this section students will learn about the impact of new and emerging technologies on people, culture and society.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Understand how technology push/market pull affects choice. 	<p>3.1.1</p>	<ul style="list-style-type: none"> ● ‘People, culture and society’ lesson plan ● ‘People, culture and society’ PowerPoint ● ‘Technology push/market pull’ worksheet ● Textbook Pages 6-8 	<p>Cultural capital- watch Video clips from Master Card adverts. Understand the importance of respecting people of different faiths and beliefs.</p>



		<ul style="list-style-type: none"> ● Know the changing job roles due to the emergence of new ways of working driven by technological change. ● Understand changes in fashion and trends in relation to new and emergent technologies. ● Understand the importance of respecting people of different faiths and beliefs. ● Know how products are designed and made to avoid having a negative impact on others, including design for disabled, the elderly and different religious groups. 			<p>Build on prior knowledge of “Inclusive Design.”</p> <p>WKGS School values.</p>
<p>14. New and emerging technologies: sustainability and the environment</p>		<p>In this section students will learn about the positive and negative impacts products have on the environment, the impact of resource consumption on the planet and how new technologies can be used to manufacture products more sustainability and reduce their ecological footprint.</p> <p><i>Learning objectives:</i></p> <ul style="list-style-type: none"> ● Explain the impact that resource consumption has on the environment. ● Understand the effects that waste disposal has on the environment and state more sustainable alternatives to landfill that make use of new technologies. 	<p>3.1.1</p>	<ul style="list-style-type: none"> ● ‘Sustainability and the environment’ PowerPoint ● ‘Finite and non-finite resources’ worksheet ● ‘Global warming and the greenhouse effect’ worksheets ● ‘6Rs’ quiz ● Textbook Pages 5-9 	<p>Build on prior knowledge- Global citizens.</p> <p>Cross curricular.</p> <p>Build on prior knowledge of The 6R’s.</p>



		<ul style="list-style-type: none"> Understand that developing new products can contribute to pollution and global warming. Explain how continuous improvement of products and efficient working can reduce the environmental impact of a product on the environment. 			
15. New and emerging technologies: production techniques		<p>In this section students will learn about the use of different production techniques and systems, including automation, CAD, CAM, flexible manufacturing systems (FMS), just in time (JIT) and lean manufacturing.</p> <p><i>Learning objectives:</i> Know and understand the contemporary and potential future use of:</p> <ul style="list-style-type: none"> automation computer-aided design (CAD) and computer-aided manufacture (CAM) flexible manufacturing systems (FMS) just in time (JIT) lean manufacturing. 	3.1.1	<ul style="list-style-type: none"> 'Production techniques and systems' PowerPoint 'CAD/CAM' worksheets 'Production techniques and systems' worksheet Textbook 	Build on prior CAD/CAM knowledge from Ks3.
16. Critical evaluation of new and emerging technologies		<p>This section draws together learning on new and emerging technologies in the previous four lessons to critically evaluate new and emerging technologies and how they inform design decisions from different perspectives.</p> <p><i>Learning objectives</i> Know how new and emerging technologies can inform design decisions in relation to:</p> <ul style="list-style-type: none"> planned obsolescence design for maintenance ethics the environment 	3.1.1	<ul style="list-style-type: none"> 'Critical evaluation of new and emerging technologies' PowerPoint 'Planned obsolescence' worksheets 'New and emerging technologies' quiz Textbook 	<p>Cultural Capital- ethics.</p> <p>Use planned obsolescence Products as physical Examples.</p>



<p>17. Energy generation : fossil fuels</p>	<p>In this section students will learn about how power is generated from coal, gas and oil.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Explain how power is generated from coal, gas and oil. ● Understand the environmental impact of power generation from fossil fuels. ● Explain the arguments for and against the selection of fossil fuels. 	<p>3.1.2</p>	<ul style="list-style-type: none"> ● 'Fossil fuels' PowerPoint ● 'Fossil fuels' worksheets ● Homework sheets ● Textbook 	<p>Build on prior cross curricular knowledge.</p>
<p>18. Energy generation : nuclear power</p>	<p>In this section students will learn about how nuclear power is generated and the arguments for and against nuclear power generation.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Explain how nuclear power is generated. ● Understand how nuclear power generation can impact the environment. ● Understand how nuclear power generation can impact on human health. ● Explain the arguments for nuclear power generation. 	<p>3.1.2</p>	<ul style="list-style-type: none"> ● YouTube video links from PowerPoint ● 'Nuclear power generation' worksheets ● 'Power generation' interactive test ● Textbook 	<p>Use clips from HBO series on Chornobyl.</p>
<p>19. Energy generation : renewable energy</p>	<p>In this section students, will learn about the different types of renewable energy.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Understand how energy can be generated from wind power. ● Understand how energy can be generated from solar power. ● Understand how energy can be generated from tidal power. 	<p>3.1.2</p>	<ul style="list-style-type: none"> ● 'Renewable energy' PowerPoint ● 'Renewable energy' worksheet ● 'Renewable energy' homework task ● Textbook Pages 15-18 	<p>WKGS reads- flipped learning task.</p>



		<ul style="list-style-type: none"> ● Understand how energy can be generated from hydro-electric sources. ● Understand how biomass can be used to generate energy. ● Explain the arguments for and against the selection of renewable power. 			
20. Energy generation : energy storage systems	<p>In this lesson students will learn about kinetic pumped storage systems and batteries.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Understand how kinetic energy can be stored ready for use. ● Understand what alkaline batteries are and how they can be used for energy storage. ● Understand what re-chargeable batteries are and how they can be used for energy storage 	3.1.2	<ul style="list-style-type: none"> ● ‘Energy storage systems’ PowerPoint ● YouTube video on Dinorwig power station ● Internet link to phys.org ● ‘Energy storage systems’ worksheets ● Textbook Pages 19-22 	Use YouTube video clips to build upon and reinforce knowledge.	
21. Systems approach to designing 1: inputs and outputs	<p>In this section students will learn about basic electronic systems and their inputs and outputs.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> ● Understand the basic principles of an electronic system. ● Know how to use systems diagrams. ● Know the names of input devices, what they are used for and how they work. ● Know the names of output devices, what they are used for and how they work. 	3.1.4	<ul style="list-style-type: none"> ● ‘Inputs and outputs’ PowerPoint ● Examples of input devices: LDR, thermistor, switches and pressure sensors ● Examples of output devices: lamps/LEDs, buzzers and speakers ● ‘Inputs and outputs’ worksheets ● Textbook Pages 30-35 	Use prior knowledge of burglar alarms, street lights etc.	



<p>22. Systems approach to designing 2: processes and microcontrollers</p>		<ul style="list-style-type: none"> In this lesson students will learn about how programming microcontrollers provides functionality to products and processes. <i>Learning objectives</i> Know how programming microcontrollers as counters, timers and for decision making can provide functionality to products and processes. 	<p>3.1.4</p>	<ul style="list-style-type: none"> 'Processes and microcontrollers' PowerPoint Crumble Kit Computer room 'Microcontrollers' interactive quiz Textbook Pages 31-35 	<p>Use YouTube clip to explain microcontrollers.</p>
<p>23. Types of movement, levers and linkages</p>		<p>In this section students will learn about different types of movement and what levers and linkages are and what they do.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> Know the different types of movement and be able to give examples of products that use them. Know what levers are and what they do. Know the different orders of lever. Know what linkages are and what they do. Know how to convert one type of motion to another. 	<p>3.1.4</p>	<ul style="list-style-type: none"> 'Types of movement, levers and linkages' PowerPoint 'Types of movement' worksheets 'Levers and linkages' worksheets 'Movement, levers and linkages' interactive quiz Modelling materials to create a mechanism Textbook Pages 36-39 	<p>Use automata and mechanism mock-up to help demonstrate the types of movement.</p>
<p>24. Rotary systems</p>		<p>In this lesson students will learn about different rotary systems and how they change magnitude and direction of force.</p> <p><i>Learning objectives</i></p> <ul style="list-style-type: none"> Know how a cam and follower works and understand that it converts rotary motion into reciprocating motion. 	<p>3.1.4</p>	<ul style="list-style-type: none"> 'Rotary systems' PowerPoint 'Cams and followers' worksheets 'Pulleys and belts' worksheets Textbook Pages 40-45 	<p>Use automata and mechanism mock-up to help demonstrate the types of movement.</p>



		<ul style="list-style-type: none"> ● Know how simple gear trains work and understand that it transmits rotary motion and torque. ● Be able to calculate the velocity ratio of a simple gear train. ● Know how pulleys and belts work and understand that they transmit rotary motion to rotary motion. ● Be able to calculate the velocity ratio of pulleys and belts. 			
<p><u>Specialist Principles</u></p> <p>This scheme of work is designed to cover the Specialist Technical Principles and Designing and Making Principles from a timber- and metal-based materials and polymers.</p>	<p>YEAR 11- PD</p>	<p>Suggested teaching activities for each teaching week based around a small practical projects that are designed to equip students with the knowledge, understanding and underpinning skills they will need for both in the written exam and for the NEA they will complete in the third year of the course (Year 11).</p>			
<p>25. Primary and secondary data</p>		<p>In this section students will learn about what primary and secondary data are and how they can be used to inform design research.</p> <p><i>Lesson objectives</i> By the end of this lesson students should be able to:</p>	<p>3.3.1</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Computers for secondary research ● Student worksheet ● Primary and secondary data interactive quiz 	<p>Build on prior knowledge of Primary and Secondary Research from Ks3.</p> <p>Cycle 1 of the Iterative Design process.</p>



		<ul style="list-style-type: none"> ● understand what primary data is ● understand what secondary data is <p>use both types of data to understand client and user needs.</p>			
26. Design brief and manufacturing specification		<p>In this section students will learn how to write a Design Brief and a Manufacturing Specification.</p> <p><i>Lesson objectives</i> By the end of this lesson students should:</p> <ul style="list-style-type: none"> ● understand what a design brief is and be able to write their own ● know what a manufacturing specification is and be able write one for their own product. 	3.3.1	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheets 	<p>Link to GCSE NEA contextual challenges.</p> <p>Cycle 1 of the Iterative Design process.</p>
27. Environmental, social and economic challenge		<p>In this section students will learn about the environmental, social and economic issues that designers could face when creating new product ideas.</p> <p><i>Lesson objectives</i> By the end of this lesson students should:</p> <ul style="list-style-type: none"> ● understand about mining, drilling and farming and their environmental impacts ● understand about deforestation and the environmental impact it has on the world ● understand about which processes contribute to global warming and atmospheric pollution ● understand the social issues in the design and manufacture of products and the need for fair trade in the world. 	3.2.3 3.3.2	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheets ● YouTube clips ● 6Rs interactive quiz ● Environmental, economic and social challenge interactive quiz 	<p>Build on prior knowledge and understanding of this topic area. Deeper understanding (spiral learning).</p>



<p>28. The work of others</p>		<p>In this section students will learn about the work of others and investigate how this can influence their own work.</p> <p><i>Lesson objectives</i> By the end of this lesson students should:</p> <ul style="list-style-type: none"> ● understand the style and influence of Sir Alec Issigonis and Marcel Breuer ● understand the style and influence of Alessi and Braun. 	<p>3.3.3</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheet ● Computers for internet research 	<p>Build on prior knowledge of Alessi, Phillippe Starck and Apple.</p> <p>Cycle 1 of the Iterative Design process.</p>
<p>29. Generating design ideas</p>		<p>In this lesson students will learn the techniques for generating design ideas as well as creating their own set of design ideas.</p> <p><i>objectives</i> By the end of this lesson students should be able to:</p> <ul style="list-style-type: none"> ● understand the different design strategies that can be used to help designing ● create a set of initial design ideas by using the iterative design process. 	<p>3.3.4 3.3.5</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student Worksheets 	<p>Build on and improve prior skills.</p> <p>Avoid design fixation.</p> <p>Cycle 2 of the Iterative Design process.</p>
<p>30. Initial design ideas</p>		<p>In this lesson students will use their knowledge of design strategies to generate a set of initial design ideas.</p> <p><i>objectives</i> By the end of this lesson students should be able to:</p> <ul style="list-style-type: none"> ● use the design brief to create a set of initial design ideas by using the iterative design process. 	<p>3.3.4 3.3.5</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student Worksheets 	<p>Build on and improve prior skills.</p> <p>Avoid design fixation.</p> <p>Cycle 2 of the Iterative Design process.</p>



<p>31. Cardboard modelling (1)</p>		<p>Over the next two lessons, students should create a card model of their design idea(s) that they feel are the most successful.</p> <p><i>Lesson objectives</i> By the end of this lesson students should be able to:</p> <ul style="list-style-type: none"> ● understand how to card model a design ● understand how to evaluate and improve a design using a card model. 	<p>3.3.4 3.3.5 3.3.6</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student Worksheets 	<p>Build on and improve prior skills.</p> <p>Avoid design fixation.</p> <p>Cycle 2 of the Iterative Design process.</p>
<p>32. Cardboard modelling (2)</p> <p>NEA contextual challenges released.</p>		<p>Over the next few lessons, students should create a card model of their design idea(s) that they feel are the most successful.</p> <p><i>Lesson objectives</i> By the end of this lesson students should:</p> <ul style="list-style-type: none"> ● understand how to card model a design ● understand how to evaluate and improve a design using a card model. 	<p>3.3.4 3.3.5 3.3.6</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student Worksheets 	<p>Build on and improve prior skills.</p> <p>Avoid design fixation.</p> <p>Cycle 2 of the Iterative Design process.</p>
<p>33. Design development</p>		<p>In this section students will use photos of their model to develop their idea ready for the final design.</p> <p><i>Lesson objectives</i> By the end of this lesson students should be able to:</p> <ul style="list-style-type: none"> ● understand how to use the model to help develop a design idea ● use exploded/parts drawings to help with the designing. 	<p>3.3.4 3.3.5 3.3.6</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student Worksheets 	<p>Build on and improve prior skills.</p> <p>Avoid design fixation.</p> <p>Cycle 2 of the Iterative Design process.</p>
<p>34. 3D CAD final model (1)</p>		<p>In these lessons' students will create their final design idea using 3D CAD to visualise and render the final design (students may need two lessons to complete this depending on their capabilities).</p>	<p>3.3.4 3.3.5 3.3.6</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheet ● Computers with 3D CAD facilities 	<p>Build on and deepen skills and knowledge of CAD and CAM.</p>



		<p><i>Lesson objectives</i> By the end of this lesson students should:</p> <ul style="list-style-type: none"> ● be able to create a final design using 3D CAD (Google sketchup) ● understand why 3D CAD is a powerful tool in communicating a design to the client. 			
35. 3D CAD final model (2)		<p>In these lessons' students will create their final design idea using 3D CAD to visualise and render the final design (students may need two lessons to complete this depending on their capabilities).</p> <p><i>Lesson objectives</i> By the end of this lesson students should:</p> <ul style="list-style-type: none"> ● be able to create a final design using 3D CAD (Google sketchup) ● understand why 3D CAD is a powerful tool in communicating a design to the client. 	<p>3.3.4 3.3.5 3.3.6</p>		<p>Build on prior CAD knowledge from Ks3 2D Design tools and Sketchup.</p>
36. Sources of materials		<p>In this section students will learn about the primary sources of materials and the main processes involved in converting them into workable forms.</p> <p><i>objectives</i> By the end of the lesson students should:</p> <ul style="list-style-type: none"> ● understand where timber-based materials come from and how they are seasoned ready for manufacturing ● understand how metal is extracted from ore and the process of refining them ready for manufacturing ● understand how polymers are manufactured from crude oil and the 	<p>3.2.4 3.3.8</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheet ● Sources of timber-based materials interactive quiz ● Sources of metal-based materials interactive quiz ● Sources of polymers interactive quiz ● Blast furnace animation 	<p>Build on and deepen prior knowledge from Ks3 (spiral learning).</p>



		processes of fractional distillation and cracking.			
37. Forces and stresses		<p>In this section students will learn about the different forces and stresses that can be placed on materials and how materials can be modified to withstand greater forces or stresses</p> <p><i>objectives</i> By the end of the lesson students should:</p> <ul style="list-style-type: none">● understand the different forces that can be present on materials● understand how materials can be modified to withstand greater forces.	3.2.2	<ul style="list-style-type: none">● Lesson PowerPoint● Student worksheets● Forces animation● Forces and stresses interactive quiz	Build on prior knowledge of tension and compression from Ks3.
38. Measuring and marking out		<p>In this section students will learn about the tools and techniques needed to measure and mark out to minimise wastage of the materials.</p> <p><i>objectives</i> By the end of the lesson students should:</p> <ul style="list-style-type: none">● understand about the different tools used for measuring and marking out● understand about the different methods for economically marking out on materials● be able to economically mark out using the correct tools on the pieces of material.	3.3.10 3.3.11	<ul style="list-style-type: none">● Student cutting lists and final designs● Measuring and marking out interactive quiz	Build confidence in practical skills and reinforce the importance of neatness and accuracy when measuring and marking out.



<p>39. Cutting (1)</p>	<p>In this section students will learn about the cutting tools that can be used to shape woods, metals and polymers. This will cover two lessons of time to allow students to cut and shape the materials accurately. This lesson should be taught in the workshop where possible.</p> <p><i>objectives</i> By the end of the lesson students should:</p> <ul style="list-style-type: none"> ● understand why we use a specific tool to cut a particular material ● be able to use the tools to try cutting straight and curved lines in each material ● be able to select and use the correct tool when cutting the pieces of the project. 	<p>3.2.5 3.2.8 3.3.9 3.3.10 3.3.11</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheets ● Material samples: 1 timber, 1 polymer, 1 metal for each student ● Tenon saw, coping saw, junior hacksaw/hacksaw ● Cutting tools interactive quiz ● Laser cutting video ● Cutting screw threads video ● Plotter cutters video 	<p>Reinforce Health and Safety.</p>
<p>40. Cutting (2)</p>	<p>In this section students will learn about the cutting tools that can be used to shape woods, metals and polymers. This will cover two lessons of time to allow students to cut and shape the materials accurately. This lesson should be taught in the workshop where possible.</p> <p><i>objectives</i> By the end of the lesson students should:</p> <ul style="list-style-type: none"> ● understand why we use a specific tool to cut a particular material ● be able to use the tools to try cutting straight and curved lines in each material ● be able to select and use the correct tool when cutting the pieces of the project. 	<p>3.2.5 3.2.8 3.3.9 3.3.10 3.3.11</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheets ● Material samples: 1 timber, 1 polymer, 1 metal for each student ● Tenon saw, coping saw, junior hacksaw/hacksaw ● Cutting tools interactive quiz 	<p>Reinforce Health and Safety. Whilst building confidence in the Workshop.</p>



<p>41. Shaping (1)</p>	<p>In this lesson students will learn the theory about how timbers, polymers and metals can be shaped. They will then have the opportunity to shape their own materials for their projects (three lessons).</p> <p><i>objectives</i> By the end of the lesson students should:</p> <ul style="list-style-type: none"> ● understand which tools are used to shape the different materials (timber, polymers and metals) ● be able use this knowledge to successfully shape their own pieces of material. 		<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheet ● Project materials ● Files, planes, sand paper ● Shaping materials interactive quiz ● Shaping wood video ● Shaping metal video ● Plastic forming (vacuum forming and press forming and line bending) video ● Sand casting video ● Lathe work (turning and drilling) video ● Milling and drilling video ● Joining metal (soldering, pop riveting, riveting) video ● Wood joints video 	<p>Reinforce Health and Safety. Whilst building confidence in the Workshop.</p>
<p>42. Shaping (2)</p>	<p>In this section students will learn the theory about how timbers, polymers and metals can be shaped. They will then have the opportunity to shape their own materials for their projects (three lessons).</p> <p><i>objectives</i> By the end of the lesson students should:</p> <ul style="list-style-type: none"> ● understand which tools are used to shape the different materials (timber, polymers and metals) ● be able use this knowledge to successfully shape their own pieces of material. 	<p>3.2.5 3.2.8 3.3.10 3.3.11</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheet ● Project materials ● Files, planes, abrasive paper ● Shaping materials interactive quiz 	<p>Reinforce Health and Safety. Whilst building confidence in the Workshop.</p>



<p>43. Shaping (3)</p>	<p>In this section students will learn the theory about how timbers, polymers and metals can be shaped. They will then have the opportunity to shape their own materials for their projects (three lessons).</p> <p><i>objectives</i> By the end of the lesson students should:</p> <ul style="list-style-type: none">● understand which tools are used to shape the different materials (timber, polymers and metals)● be able use this knowledge to successfully shape their own pieces of material.		<ul style="list-style-type: none">● Lesson PowerPoint● Student worksheet● Project materials● Files, planes, sand paper● Shaping materials interactive quiz	<p>Reinforce Health and Safety. Whilst building confidence in the Workshop.</p>
<p>44. Scales of production</p>	<p>In this section students will learn about the links between commercial processes and scales of production.</p> <p><i>objectives</i> By the end of the lessons students should:</p> <ul style="list-style-type: none">● understand what a prototype/one-off product is● understand what kinds of products are manufactured using batch production● understand what kinds of products are manufactured using mass production● understand what kinds of products are manufactured using continuous production.	<p>3.2.7</p>	<ul style="list-style-type: none">● Lesson PowerPoint● Student worksheet● YouTube videos● Scales of production interactive quiz● Milling video● CNC turning video● CNC routing and milling video● Laser cutting video● Rapid prototyping video	<p>Build on prior knowledge and use examples of different scales of production.</p>



<p>45. Quality control</p>		<p>In this section students will learn about the application and use of quality control to assist in the manufacturing of products.</p> <p><i>objectives</i> By the end of the lessons students:</p> <ul style="list-style-type: none"> ● understand how quality control can be achieved in timber-based products ● understand how quality control can be achieved in metal-based products ● understand how quality control can be achieved in polymer-based products ● understand how you can apply quality control checks to the manufacturing of a product. 	<p>3.2.8 3.3.8</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheet ● Using jigs video 	<p>Next steps are to ensure students understand the difference between QA and QC. Use examples to help knowledge and understanding.</p>
<p>46. Commercial processes and surface finishes</p> <p>Year 11 majority of time is spent on NEA (50% of overall mark)</p>		<p>In this section students will learn about the different surface treatments and finishes that can be applied to timbers, metals and polymers. Once the students have planned the finishes, they should spend time preparing and finishing their product.</p> <p><i>Objectives</i> By the end of the lesson students should:</p> <ul style="list-style-type: none"> ● understand which finishes can be applied to timbers and why they are needed ● understand which finishes can be applied to metals and why they are needed ● understand which finishes can be applied to polymers and why they are needed 	<p>3.2.8 3.2.9 3.3.11</p>	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheets ● Surface treatments and finishes interactive quiz ● Metal finishing video 	<p>Next steps- Set HW task of watching and summarising commercial processes video clips.</p>



		<ul style="list-style-type: none"> ● be able to make choices about the finishes that need to be applied to their personal valet design and apply them to enhance the functional and aesthetic properties. 			
47. Analysis and evaluation of prototypes		<p>In this section students will evaluate and analyse the success of their prototype product and suggest potential future modifications. Depending on resources available, this could span two lessons of time.</p> <p><i>Objectives</i> By the end of the lesson students should:</p> <ul style="list-style-type: none"> ● understand why evaluation is important ● understand how to evaluate the success of a product. 	3.3.4 3.3.6	<ul style="list-style-type: none"> ● Lesson PowerPoint ● Student worksheet 	Utilise prior knowledge of ACCESS FM.
48. Maths content 1 (15% of written exam)		<p>Students must be able to apply the following mathematical skills.</p> <p>1 Arithmetic and numerical computation</p> <p>1a Recognise and use expressions in decimal and standard form. Calculation of quantities of materials, costs and sizes. 1b Use ratios, fractions and percentages. Scaling drawings, analysing responses to user questionnaires. 1c Calculate surface area and volume. Determining quantities of materials.</p>		<ul style="list-style-type: none"> ● PowerPoint 	Build on prior cross curricular knowledge but ensure that DT context is considered. Work with Math dept where appropriate.



<p>49. Maths content 2 (15% of written exam)</p>	<p>2 Handling data</p> <p>2a Presentation of data, diagrams, bar charts and histograms. Construct and interpret frequency tables; present information on design decisions.</p>		<ul style="list-style-type: none"> ● PowerPoint 	<p>Build on prior cross curricular knowledge but ensure that DT context is considered. Work with Math dept where appropriate.</p>
<p>50. Maths content 3 (15% of written exam)</p>	<p>3 Graphs</p> <p>3a Plot, draw and interpret appropriate graphs. Analysis and presentation of performance data and client survey responses.</p> <p>3b Translate information between graphical and numeric form. Extracting information from technical specifications.</p>		<ul style="list-style-type: none"> ● PowerPoint 	<p>Build on prior cross curricular knowledge but ensure that DT context is considered. Work with Math dept where appropriate.</p>
<p>51. Maths content 4 (15% of written exam)</p>	<p>4 Geometry and trigonometry</p> <p>4a Use angular measures in degrees. Measurement and marking out, creating tessellated patterns.</p> <p>4b Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. Graphic presentation of design ideas and communicating intentions to others.</p> <p>4c Calculate areas of triangles and rectangles, surface areas and volumes of cubes. Determining the quantity of materials required.</p>		<ul style="list-style-type: none"> ● PowerPoint 	<p>Build on prior cross curricular knowledge but ensure that DT context is considered. Work with Math dept where appropriate.</p>
<p>52. Exam prep</p>	<p>Students to study past papers in detail. Whilst developing techniques to answering certain questions. Time management and exam top tips also included in these lessons.</p>		<ul style="list-style-type: none"> ● Past papers ● 3 Sample PG Online papers ● AQA exam feedback ● AQA enhanced exam analysis 	<p>See exam top tips and Exam room PowerPoint Presentations.</p>