West Kirby Grammar School

# **Curriculum Map** – GCSE Product Design

| Topic Name | Term | Skills Developed | AQA Specification reference | Other Notes |
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| **<u>Core Principles</u>**<br><br>**1. Materials and their working properties 1**<br><br>***Practical design and make projects (timber/manufactured board and or polymers) run in conjunction with core principle knowledge.*** | Year 9<br>Term 1 | 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.<br><br>*Learning objectives*<br>Know and understand physical properties of materials such as:<br>• absorbency (resistance to moisture)<br>• density<br>• fusibility<br>• electrical and thermal conductivity. | 3.1.6.2 | • 'Physical properties of materials' PowerPoint<br>• Waterproof coat<br>• Polystyrene foam<br>• Solder and soldering irons<br>• Batteries, wires and bulbs and/or buzzers to make circuits with and a range of electrical conductors and insulators<br>• Metal spoon and wooden spoon<br>• Physical properties of materials sorting cards (printed for pairs or small groups, cut out and placed in envelopes)<br>• Textbook Pages 63–65 |
| **2. Materials and their working properties** | Year 9<br>Term 1 | 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. | 3.1.6.2 | • 'Working properties of materials' PowerPoint<br>• 'Working properties of materials' worksheets<br>• A range of materials (30 mm× 30 mm) for hardness testing: aluminium, copper, hardwood, softwood, acrylic, PET, natural fibre (e.g. cotton), synthetic fibre |

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| | | *Learning objectives*<br>Know and understand the following working properties of materials:<br>• strength<br>• hardness<br>• toughness<br>• malleability<br>• ductility<br>• elasticity. | | (e.g. silk), paper, corrugated cardboard<br>• Centre punches<br>• Test tube clamps<br>• 300 mm long piece of HIPS tube<br>• Small piece of electric cable<br>• Elastic band or piece of Lycra<br>• Textbook Pages 63–65 |
| **3. Papers and boards**<br><br>***Small design and make (graphics packaging) projects run alongside. Focussing on net design and CAD/CAM.*** | Year 9<br>Term 1 | In this section students will learn about the most common papers and boards.<br><br>*Learning objectives*<br>• Know the primary sources of materials for producing papers and boards.<br>• Be able to recognise and characterise different types of papers and boards.<br><br>Understand how the physical and working properties of a range of paper and board products affect their performance. | 3.1.6.1 | • 'Paper and boards' PowerPoint<br>• 'Paper and boards' worksheets<br>• Examples of papers – bleed proof marker paper, cartridge paper, grid paper, layout paper, tracing paper<br>• Examples of boards – corrugated cardboard, duplex board, foil lined board, foam core board, ink jet card, solid white board<br>• Textbook Pages 46–48 |

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| **4. Natural and manufactured timbers** | Year 9<br>Term 1 | In this section students will learn about the working properties of natural and manufactured timber.<br><br>*Learning objectives*<br>• Explain the different classifications of natural timber.<br>• Explain the properties and uses of a variety of softwoods.<br>• Explain the properties and uses of a variety of hardwoods.<br>• Explain the different classifications of manufactured timber.<br>• Explain the properties and uses of a variety of manufactured boards.<br>• Explain the advantages and disadvantages of using natural and manufactured timber. | 3.1.6.1 | • 'Natural timber and manufacture timber' PowerPoint<br>• YouTube clip 'How it's made – Timber': https://youtu.be/SwxinbpQ9B4<br>• YouTube clip 'How it's made – Plywood': https://youtu.be/xGnr8ATHHX8?list=PLIF-zAoABDYvIqUzdRuA1dB9aP-0acbDf<br>• 'Natural timber and manufacture timber' worksheets<br>• Samples of softwood e.g. pine<br>• Samples of hardwood e.g. oak, mahogany, beech<br>• Samples of manufacture timber e.g. plywood, MDF, chipboard<br>• 'Natural timber and manufacture timber' interactive test<br>• Homework sheet<br>• Textbook Pages 49–52 |
| **5. Metals and alloys** | Year 9<br>Term 1 | In this section students will learn about the working properties of metals and alloys.<br><br>*Learning objectives*<br>• Explain the different classifications of metals. | 3.1.6.1 | • 'Metals and alloys' PowerPoint<br>• 'Metals and alloys' worksheet<br>• Samples of a cast iron e.g. a vice<br>• Samples of stainless steel e.g. cutlery<br>• Samples of non-ferrous metals e.g. copper piping, aluminium drinks can |

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| | | • Explain the properties and uses of a variety of ferrous metals.<br>• Explain the properties and uses of a variety of non-ferrous metals.<br>• Define a ferrous and a non-ferrous alloy.<br>• Explain the properties and uses of a variety of ferrous alloys.<br>• Explain the properties and uses of a variety of non-ferrous alloys. | | • 'Metals and alloys' interactive test<br>• YouTube clip 'Ferrous metals': https://youtu.be/AWK7T9bz0RA<br>• Homework sheet<br>• Textbook Pages 53-55 |
| **6. Polymers** | Year 9<br>Term 1 | In this section students will learn about the working properties of polymers.<br><br>*Learning objectives*<br>• Understand the different classifications of polymers.<br>• Explain the properties and uses of a variety of thermoforming polymers.<br>• Explain the properties and uses of a variety of thermosetting polymers.<br>• Understand how additives can alter the mechanical and physical properties of polymers. | 3.1.6.1 | • 'Polymers' PowerPoint<br>• 'Polymers' worksheet<br>• Samples of thermoforming polymers (e.g. yoghurt pots, carrier bag)<br>• Samples of thermosetting polymers (e.g. section of a kitchen worktop, kitchen spatula)<br>• 'Polymers' interactive test<br>• Homework sheet<br>• Textbook Pages 56–57 |
| **7. Textiles**<br><br>**(rotate specialist teachers within the dept when possible. AD & JP cover TX and JF** | Year 9<br>Term 1 | In this section students will learn about the main categories and working properties of textiles.<br><br>*Learning objectives*<br>• Be able to list the main categories and types of textiles. | 3.1.6.1 | • 'Textiles' PowerPoint<br>• 'Natural and synthetic fibres' flash cards<br>• 'Natural and synthetic fibres' grid<br>• 'Fibres and fabrics' worksheets |

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| **and JY teaching RM)** | | • Be able to give examples of fibres and fabrics in each category.<br>• Understand the physical and working properties of each category.<br>• Be able to identify products that different fibres/fabrics could be used for. | | • 'Working properties of textiles' quiz<br>• Textbook Pages 58–62 |
| **8. Modern materials** | Year 9<br>Term 2 | In this section students learn about a range of modern materials and their working properties.<br><br>*Learning objectives*<br>• Understand about the invention of new materials such as graphene, metal foams and titanium.<br>• Understand the properties of these materials and why this helps with their selection.<br>• Understand how materials can be altered to specific applications. | 3.1.3 | • 'Modern materials' PowerPoint<br>• YouTube video on graphene<br>• YouTube video on metal Foams<br>• Textbook Pages 23–25 |

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| **9. Smart materials** | Year 9<br>Term 2 | In this section students will learn about four key smart materials and how they react to the environment around them.<br><br>*Learning objectives*<br>• Understand how a smart material works.<br>• Know what thermochromic pigments are and how they work.<br>• Know what photochromic pigments are and how they work.<br>• Know what shape memory alloys are and how they work. | 3.1.3 | • 'Smart materials' PowerPoint<br>• YouTube video on thermochromic pigment<br>• YouTube video on photochromic pigment<br>• YouTube video on shape memory alloys<br>• 'Smart materials' worksheets<br>• School examples of smart materials<br>• Textbook |
| **10. Composites** | Year 9<br>Term 2 | In this section students will learn about composite materials and how they can improve the properties of the material.<br><br>*Learning objectives*<br>• Understand how new materials can be created by combining two or more materials.<br>• Recognise a range of composite materials. | 3.1.3 | • 'Composites' PowerPoint<br>• 'Composites' worksheets<br>• Textbook |
| **11. Technical textiles (summer term increased chance of swapping teachers for specialist areas)** | Year 9<br>Term 2 | 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.<br><br>*Learning objectives*<br>• Explain what is meant by the term technical textiles. | 3.1.3 | • 'Technical textiles' PowerPoint<br>• YouTube clip 'Nomex and Kevlar': https://youtu.be/72vOt3ggiPI<br>• 'Technical textiles' worksheet<br>• 'Technical textiles' interactive quiz<br>• Textbook Pages 28–29 |

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| | | • Explain how conductive fabrics are produced.<br>• Give examples of uses of fire resistant fabrics and state their properties.<br>• State the properties of Kevlar® and give example applications.<br>• Explain how microfibres incorporate micro encapsulation. | | |
| **12. New and emerging technologies: industry and enterprise** | Year 9<br>Term 2 | 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.<br><br>*Learning objectives*<br>• Understand how new and emerging technologies have impacted on the design and organisation of the workplace (including automation and the use of robotics).<br>• Understand how new and emerging technologies affect where we work.<br>• Understand the tools and equipment we use and how it has been affected by technology. | 3.1.1 | • 'Industry and enterprise' PowerPoint<br>• Student worksheet 'The impact of new and emerging technologies on the workplace'<br>• 'Industry and enterprise' quiz<br>• Textbook Pages 2–4 |

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| | | Describe enterprise that has developed as a result of business innovation (for example, crowd funding, virtual marketing and retail, co-operatives and fair trade. | | |
| **13. New and emerging technologies: people, culture and society** | Year 9<br>Term 3 | In this section students will learn about the impact of new and emerging technologies on people, culture and society.<br><br>*Learning objectives*<br>● Understand how technology push/market pull affects choice.<br>● Know the changing job roles due to the emergence of new ways of working driven by technological change.<br>● Understand changes in fashion and trends in relation to new and emergent technologies.<br>● Understand the importance of respecting people of different faiths and beliefs.<br>● 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. | 3.1.1 | ● 'People, culture and society' lesson plan<br>● 'People, culture and society' PowerPoint<br>● 'Technology push/market pull' worksheet<br>● Textbook Pages 6-8 |

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| **14. New and emerging technologies: sustainability and the environment** | Year 9<br>Term 3 | 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.<br><br>*Learning objectives:*<br>• Explain the impact that resource consumption has on the environment.<br>• Understand the effects that waste disposal has on the environment and state more sustainable alternatives to landfill that make use of new technologies.<br>• Understand that developing new products can contribute to pollution and global warming.<br>• Explain how continuous improvement of products and efficient working can reduce the environmental impact of a product on the environment. | 3.1.1 | • 'Sustainability and the environment' PowerPoint<br>• 'Finite and non-finite resources' worksheet<br>• 'Global warming and the greenhouse effect' worksheets<br>• '6Rs' quiz<br>• Textbook Pages 5-9 |
| **15. New and emerging technologies: production techniques** | Year 9<br>Term 3 | 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.<br><br>*Learning objectives:* | 3.1.1 | • 'Production techniques and systems' PowerPoint<br>• 'CAD/CAM' worksheets<br>• 'Production techniques and systems' worksheet<br>• Textbook |

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| | | Know and understand the contemporary and potential future use of:<br>● automation<br>● computer-aided design (CAD) and computer-aided manufacture (CAM)<br>● flexible manufacturing systems (FMS)<br>● just in time (JIT)<br>● lean manufacturing. | | |
| **16. Critical evaluation of new and emerging technologies** | Year 9<br>Term 3 | 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.<br><br>*Learning objectives*<br>Know how new and emerging technologies can inform design decisions in relation to:<br>● planned obsolescence<br>● design for maintenance<br>● ethics<br>● the environment | 3.1.1 | ● 'Critical evaluation of new and emerging technologies' PowerPoint<br>● 'Planned obsolescence' worksheets<br>● 'New and emerging technologies' quiz<br>● Textbook |
| **17. Energy generation: fossil fuels** | Year 9<br>Term 3 | In this section students will learn about how power is generated from coal, gas and oil.<br><br>*Learning objectives*<br>● Explain how power is generated from coal, gas and oil. | 3.1.2 | ● 'Fossil fuels' PowerPoint<br>● 'Fossil fuels' worksheets<br>● Homework sheets<br>● Textbook |

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| | | • Understand the environmental impact of power generation from fossil fuels.<br>• Explain the arguments for and against the selection of fossil fuels. | | |
| **18. Energy generation: nuclear power** | Year 9<br>Term 3 | In this section students will learn about how nuclear power is generated and the arguments for and against nuclear power generation.<br><br>*Learning objectives*<br>• Explain how nuclear power is generated.<br>• Understand how nuclear power generation can impact the environment.<br>• Understand how nuclear power generation can impact on human health.<br>• Explain the arguments for nuclear power generation. | 3.1.2 | • YouTube video links from PowerPoint<br>• 'Nuclear power generation' worksheets<br>• 'Power generation' interactive test<br>• Textbook |
| **19. Energy generation: renewable energy** | Year 10<br>Term 1 | In this section students, will learn about the different types of renewable energy.<br><br>*Learning objectives*<br>• Understand how energy can be generated from wind power.<br>• Understand how energy can be generated from solar power.<br>• Understand how energy can be generated from tidal power. | 3.1.2 | • 'Renewable energy' PowerPoint<br>• 'Renewable energy' worksheet<br>• 'Renewable energy' homework task<br>• Textbook Pages 15-18 |

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| | | • Understand how energy can be generated from hydro-electric sources.<br>• Understand how biomass can be used to generate energy.<br>• Explain the arguments for and against the selection of renewable power. | | |
| **20. Energy generation: energy storage systems** | Year 10<br>Term 1 | In this lesson students will learn about kinetic pumped storage systems and batteries.<br><br>*Learning objectives*<br>• Understand how kinetic energy can be stored ready for use.<br>• Understand what alkaline batteries are and how they can be used for energy storage.<br>• Understand what re-chargeable batteries are and how they can be used for energy storage | 3.1.2 | • 'Energy storage systems' PowerPoint<br>• YouTube video on Dinorwig power station<br>• Internet link to phys.org<br>• 'Energy storage systems' worksheets<br>• Textbook Pages 19-22 |
| **21. Systems approach to designing 1: inputs and outputs** | Year 10<br>Term 1 | In this section students will learn about basic electronic systems and their inputs and outputs.<br><br>*Learning objectives*<br>• Understand the basic principles of an electronic system.<br>• Know how to use systems diagrams.<br>• Know the names of input devices, what they are used for and how they work. | 3.1.4 | • 'Inputs and outputs' PowerPoint<br>• Examples of input devices: LDR, thermistor, switches and pressure sensors<br>• Examples of output devices: lamps/LEDs, buzzers and speakers<br>• 'Inputs and outputs' worksheets<br>• Textbook Pages 30-35 |

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| | | • Know the names of output devices, what they are used for and how they work. | | |
| **22. Systems approach to designing 2: processes and microcontrollers** | Year 10<br>Term 1 | • In this lesson students will learn about how programming microcontrollers provides functionality to products and processes.<br><br>• *Learning objectives*<br>• Know how programming microcontrollers as counters, timers and for decision making can provide functionality to products and processes. | 3.1.4 | • 'Processes and microcontrollers' PowerPoint<br>• Crumble Kit<br>• Computer room<br>• 'Microcontrollers' interactive quiz<br>• Textbook Pages 31-35 |
| **23. Types of movement, levers and linkages** | Year 10<br>Term 1 | In this section students will learn about different types of movement and what levers and linkages are and what they do.<br><br>*Learning objectives*<br>• Know the different types of movement and be able to give examples of products that use them.<br>• Know what levers are and what they do.<br>• Know the different orders of lever. | 3.1.4 | • 'Types of movement, levers and linkages' PowerPoint<br>• 'Types of movement' worksheets<br>• 'Levers and linkages' worksheets<br>• 'Movement, levers and linkages' interactive quiz<br>• Modelling materials to create a mechanism<br>• Textbook Pages 36-39 |

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| | | • Know what linkages are and what they do.<br>• Know how to convert one type of motion to another. | | |
| **24. Rotary systems** | Year 10<br>Term 1 | In this lesson students will learn about different rotary systems and how they change magnitude and direction of force.<br><br>*Learning objectives*<br>• Know how a cam and follower works and understand that it converts rotary motion into reciprocating motion.<br>• Know how simple gear trains work and understand that it transmits rotary motion and torque.<br>• Be able to calculate the velocity ratio of a simple gear train.<br>• Know how pulleys and belts work and understand that they transmit rotary motion to rotary motion.<br>• Be able to calculate the velocity ratio of pulleys and belts. | 3.1.4 | • 'Rotary systems' PowerPoint<br>• 'Cams and followers' worksheets<br>• 'Pulleys and belts' worksheets<br>• Textbook Pages 40-45 |
| **<u>Specialist Principles</u>**<br><br>*This scheme of work is designed to cover the Specialist Technical Principles and Designing and Making* | | **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** | | |

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| *Principles specialising mainly on timbers and polymers.* | | **written exam and for the NEA they will complete in the third year of the course (Year 11).** | | |
| **25. Primary and secondary data** | Year 10<br>Term 2 | In this section students will learn about what primary and secondary data are and how they can be used to inform design research.<br><br>*Lesson objectives*<br>By the end of this lesson students should be able to:<br>● understand what primary data is<br>● understand what secondary data is use both types of data to understand client and user needs. | 3.3.1 | ● Lesson PowerPoint<br>● Computers for secondary research<br>● Student worksheet<br>● Primary and secondary data interactive quiz |
| **26. Design brief and manufacturing specification** | Year 10<br>Term 2 | In this section students will learn how to write a Design Brief and a Manufacturing Specification.<br><br>*Lesson objectives*<br>By the end of this lesson students should:<br>● 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 | ● Lesson PowerPoint<br>Student worksheets |

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| **27. Environmental, social and economic challenge** | Year 10<br>Term 2 | In this section students will learn about the environmental, social and economic issues that designers could face when creating new product ideas.<br><br>*Lesson objectives*<br>By the end of this lesson students should:<br>• understand about mining, drilling and farming and their environmental impacts<br>• understand about deforestation and the environmental impact it has on the world<br>• understand about which processes contribute to global warming and atmospheric pollution<br>• understand the social issues in the design and manufacture of products and the need for fair trade in the world. | 3.2.3<br>3.3.2 | • Lesson PowerPoint<br>• Student worksheets<br>• YouTube clips<br>• 6Rs interactive quiz<br>• Environmental, economic and social challenge interactive quiz |
| **28. The work of others** | Year 10<br>Term 2 | In this section students will learn about the work of others and investigate how this can influence their own work.<br><br>*Lesson objectives*<br>By the end of this lesson students should:<br>• understand the style and influence of Sir Alec Issigonis and Marcel Breuer<br>• understand the style and influence of Alessi and Braun. | 3.3.3 | • Lesson PowerPoint<br>• Student worksheet<br>• Computers for internet research |

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| **29. Generating design ideas** | Year 10<br>Term 2 | In this lesson students will learn the techniques for generating design ideas as well as creating their own set of design ideas.<br><br>*objectives*<br>By the end of this lesson students should be able to:<br>● understand the different design strategies that can be used to help designing<br>● create a set of initial design ideas by using the iterative design process. | 3.3.4<br>3.3.5 | ● Lesson PowerPoint<br>● Student Worksheets |
| **30. Initial design ideas** | Year 10<br>Term 2 | In this lesson students will use their knowledge of design strategies to generate a set of initial design ideas.<br><br>*objectives*<br>By the end of this lesson students should be able to:<br>● use the design brief to create a set of initial design ideas by using the iterative design process. | 3.3.4<br>3.3.5 | ● Lesson PowerPoint<br>● Student Worksheets |
| **31. Cardboard modelling (1)** | Year 10<br>Term 2 | Over the next two lessons, students should create a card model of their design idea(s) that they feel are the most successful.<br><br>*Lesson objectives*<br>By the end of this lesson students should be able to: | 3.3.4<br>3.3.5<br>3.3.6 | ● Lesson PowerPoint<br>● Student Worksheets |

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| | | • understand how to card model a design<br>• understand how to evaluate and improve a design using a card model. | | |
| **32. Cardboard modelling (2)** | Year 10<br>Term 2 | Over the next few lessons, students should create a card model of their design idea(s) that they feel are the most successful.<br><br>*Lesson objectives*<br>By the end of this lesson students should:<br>• understand how to card model a design<br>• understand how to evaluate and improve a design using a card model. | 3.3.4<br>3.3.5<br>3.3.6 | • Lesson PowerPoint<br>• Student Worksheets |
| **33. Design development** | Year 10<br>Term 2 | In this section students will use photos of their model to develop their idea ready for the final design.<br><br>*Lesson objectives*<br>By the end of this lesson students should be able to:<br>• understand how to use the model to help develop a design idea<br>• use exploded/parts drawings to help with the designing. | 3.3.4<br>3.3.5<br>3.3.6 | • Lesson PowerPoint<br>• Student Worksheets |

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| **34. 3D CAD final model (1)** | Year 10<br>Term 2 | 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).<br><br>*Lesson objectives*<br>By the end of this lesson students should:<br>● be able to create a final design using 3D CAD (Google sketchup)<br>● understand why 3D CAD is a powerful tool in communicating a design to the client. | 3.3.4<br>3.3.5<br>3.3.6 | ● Lesson PowerPoint<br>● Student worksheet<br>● Computers with 3D CAD facilities |
| **35. 3D CAD final model (2)**<br><br>**NEA contextual challenges released this term (early June).** | Year 10<br>Term 3 | 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).<br><br>*Lesson objectives*<br>By the end of this lesson students should:<br>● be able to create a final design using 3D CAD (Google sketchup)<br>● understand why 3D CAD is a powerful tool in communicating a design to the client. | 3.3.4<br>3.3.5<br>3.3.6 | ● |

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| **36. Sources of materials** | Year 10<br>Term 3 | In this section students will learn about the primary sources of materials and the main processes involved in converting them into workable forms.<br><br>*objectives*<br>By the end of the lesson students should:<br>• understand where timber-based materials come from and how they are seasoned ready for manufacturing<br>• understand how metal is extracted from ore and the process of refining them ready for manufacturing<br>• understand how polymers are manufactured from crude oil and the processes of fractional distillation and cracking. | 3.2.4<br>3.3.8 | • Lesson PowerPoint<br>• Student worksheet<br>• Sources of timber-based materials interactive quiz<br>• Sources of metal-based materials interactive quiz<br>• Sources of polymers interactive quiz<br>• Blast furnace animation |
| **37. Forces and stresses** | Year 10<br>Term 3 | 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<br><br>*objectives*<br>By the end of the lesson students should:<br>• understand the different forces that can be present on materials<br>• understand how materials can be modified to withstand greater forces. | 3.2.2 | • Lesson PowerPoint<br>• Student worksheets<br>• Forces animation<br>• Forces and stresses interactive quiz |

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| **38. Measuring and marking out** | Year 10<br>Term 3 | In this section students will learn about the tools and techniques needed to measure and mark out to minimise wastage of the materials.<br><br>*objectives*<br>By the end of the lesson students should:<br>• understand about the different tools used for measuring and marking out<br>• understand about the different methods for economically marking out on materials<br>• be able to economically mark out using the correct tools on the pieces of material. | 3.3.10<br>3.3.11 | • Student cutting lists and final designs<br>• Measuring and marking out interactive quiz |
| **39. Cutting (1)** | Year 10<br>Term 3 | 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.<br><br>*objectives*<br>By the end of the lesson students should:<br>• understand why we use a specific tool to cut a particular material<br>• be able to use the tools to try cutting straight and curved lines in each material | 3.2.5<br>3.2.8<br>3.3.9<br>3.3.10<br>3.3.11 | • Lesson PowerPoint<br>• Student worksheets<br>• Material samples: 1 timber, 1 polymer, 1 metal for each student<br>• Tenon saw, coping saw, junior hacksaw/hacksaw<br>• Cutting tools interactive quiz<br>• Laser cutting video<br>• Cutting screw threads video<br>• Plotter cutters video |

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| | | • be able to select and use the correct tool when cutting the pieces of the project. | | |
| **40. Cutting (2)** | Year 10<br>Term 3 | 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.<br><br>*objectives*<br>By the end of the lesson students should:<br>• understand why we use a specific tool to cut a particular material<br>• be able to use the tools to try cutting straight and curved lines in each material<br>• be able to select and use the correct tool when cutting the pieces of the project. | 3.2.5<br>3.2.8<br>3.3.9<br>3.3.10<br>3.3.11 | • Lesson PowerPoint<br>• Student worksheets<br>• Material samples: 1 timber, 1 polymer, 1 metal for each student<br>• Tenon saw, coping saw, junior hacksaw/hacksaw<br>• Cutting tools interactive quiz |
| **41. Shaping (1)** | Year 10<br>Term 3 | 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). | | • Lesson PowerPoint<br>• Student worksheet<br>• Project materials<br>• Files, planes, sand paper<br>• Shaping materials interactive quiz |

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| | | *objectives*<br>By the end of the lesson students should:<br>• understand which tools are used to shape the different materials (timber, polymers and metals)<br>• be able use this knowledge to successfully shape their own pieces of material. | | • Shaping wood video<br>• Shaping metal video<br>• Plastic forming (vacuum forming and press forming and line bending) video<br>• Sand casting video<br>• Lathe work (turning and drilling) video<br>• Milling and drilling video<br>• Joining metal (soldering, pop riveting, riveting) video<br>• Wood joints video |
| **42. Shaping (2)** | Year 10<br>Term 3 | 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).<br><br>*objectives*<br>By the end of the lesson students should:<br>• understand which tools are used to shape the different materials (timber, polymers and metals)<br>• be able use this knowledge to successfully shape their own pieces of material. | 3.2.5<br>3.2.8<br>3.3.10<br>3.3.11 | • Lesson PowerPoint<br>• Student worksheet<br>• Project materials<br>• Files, planes, abrasive paper<br>• Shaping materials interactive quiz |

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| **43. Shaping (3)** | Year 10<br>Term 3 | 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).<br><br>*objectives*<br>By the end of the lesson students should:<br>• understand which tools are used to shape the different materials (timber, polymers and metals)<br>• be able use this knowledge to successfully shape their own pieces of material. | | • Lesson PowerPoint<br>• Student worksheet<br>• Project materials<br>• Files, planes, sand paper<br>• Shaping materials interactive quiz |
| **44. Scales of production** | Year 10<br>Term 3 | In this section students will learn about the links between commercial processes and scales of production.<br><br>*objectives*<br>By the end of the lessons students should:<br>• understand what a prototype/one-off product is<br>• understand what kinds of products are manufactured using batch production<br>• understand what kinds of products are manufactured using mass production | 3.2.7 | • Lesson PowerPoint<br>• Student worksheet<br>• YouTube videos<br>• Scales of production interactive quiz<br>• Milling video<br>• CNC turning video<br>• CNC routing and milling video<br>• Laser cutting video<br>• Rapid prototyping video |

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| | | • understand what kinds of products are manufactured using continuous production. | | |
| **45. Quality control** | Year 10<br>Term 3 | In this section students will learn about the application and use of quality control to assist in the manufacturing of products.<br><br>*objectives*<br>By the end of the lessons students:<br>• understand how quality control can be achieved in timber-based products<br>• understand how quality control can be achieved in metal-based products<br>• understand how quality control can be achieved in polymer-based products<br>• understand how you can apply quality control checks to the manufacturing of a product. | 3.2.8<br>3.3.8 | • Lesson PowerPoint<br>• Student worksheet<br>• Using jigs video |
| **46. Commercial processes and surface finishes**<br><br>**Year 11 majority of time is spent** | Year 11 | 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. | 3.2.8<br>3.2.9<br>3.3.11 | • Lesson PowerPoint<br>• Student worksheets<br>• Surface treatments and finishes interactive quiz<br>• Metal finishing video |

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| **on NEA (50% of overall mark)** | | *Objectives*<br>By the end of the lesson students should:<br>● understand which finishes can be applied to timbers and why they are needed<br>● understand which finishes can be applied to metals and why they are needed<br>● understand which finishes can be applied to polymers and why they are needed<br>● 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** | Year 11 | 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.<br><br>*Objectives*<br>By the end of the lesson students should:<br>● understand why evaluation is important<br>● understand how to evaluate the success of a product. | 3.3.4<br>3.3.6 | ● Lesson PowerPoint<br>● Student worksheet |

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| **48. Maths content 1 (15% of written exam)** | Year 11 | Students must be able to apply the following mathematical skills.<br><br>1 Arithmetic and numerical computation<br><br>1a Recognise and use expressions in decimal and standard form. Calculation of quantities of materials, costs and sizes.<br>1b Use ratios, fractions and percentages. Scaling drawings, analysing responses to user questionnaires.<br>1c Calculate surface area and volume. Determining quantities of materials. | | • PowerPoint |
| **49. Maths content 2 (15% of written exam)** | Year 11 | 2 Handling data<br><br>2a Presentation of data, diagrams, bar charts and histograms. Construct and interpret frequency tables; present information on design decisions. | | • PowerPoint |
| **50. Maths content 3 (15% of written exam)** | Year 11 | 3 Graphs<br><br>3a Plot, draw and interpret appropriate graphs. Analysis and presentation of performance data and client survey responses.<br>3b Translate information between graphical and numeric form. Extracting information from technical specifications. | | • PowerPoint |

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| **51. Maths content 4 (15% of written exam)** | Year 11 | 4 Geometry and trigonometry<br><br>4a Use angular measures in degrees. Measurement and marking out, creating tessellated patterns.<br>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.<br>4c Calculate areas of triangles and rectangles, surface areas and volumes of cubes. Determining the quantity of materials required. | | • PowerPoint |
| **52. Exam prep** | Year 11 | 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. | | • Past papers<br>• 3 Sample PG Online papers<br>• AQA exam feedback<br>• AQA enhanced exam analysis |