KS4 Design and Technology Curriculum Map
Year 10 Sequencing

Autumn Term	Spring Term	Summer Term
Unit 1: Technology in manufacturing To Develop, demonstrate and apply knowledge and understanding of how the manufacturing system works. Manufacturing is a system , Automation of manufacturing Smart Technology in manufacturing, Tracking of materials, tools, equipment and products, Communication Systems, Specialised Buildings, Flexible, Manufacturing Systems, Lean, Manufacturing, Just In Time	**Unit 7: Properties of materials** To Develop, demonstrate and apply knowledge and understanding of how the differing properties of a material can determine what it is used for. Working Properties, Strength, Hardness, Toughness, Elasticity, Malleability, Ductility ,Physical Properties, Electrical Conductivity, Thermal Conductivity, Fusibility, Density, Absorbency Alloys Introduction – improving properties	**Unit 17: Selecting materials** To develop, demonstrate and apply knowledge and understanding of factors affecting the selection of materials Functionality, Availability, Aesthetics, Cost, Environmental factors, Social Factors, Ethical Factors, Cultural Factors
Unit 2: Production systems To Develop, demonstrate and apply knowledge and understanding of the importance of CAD/CAM when designing products and manufacturing them. CAD/CAM CAM Machines CAD/CAM and Global Companies	**Unit 8: Paper and board** To Develop, demonstrate and apply knowledge and understanding of materials can be made from plants and trees. Types of paper, Selection of boards, Solid white board, Ink jet card, Corrugated card, Duplex board, Foam core board, Foil-lined board	**Unit 18: Forces and stresses** To develop, demonstrate and apply knowledge and understanding of forces and stresses and how they can be used to our advantage Tension, Compression, Shear Bending, Torsion, Adapting materials
Unit 3: Product sustainability To Develop, demonstrate and apply knowledge and understanding of how manufactured products have an impact on the environment. Sustainable Products, Carbon Footprint, Design for Disassembly, Designed Obsolescence, Design for Repair	**Unit 9: Timbers** To develop, demonstrate and apply knowledge and understanding of categories of timber Softwoods, Hardwoods	**Unit 19: Scales of production** To develop, demonstrate and apply knowledge and understanding of scales of production in manufacturing One-off production, Batch production, Mass production, Continuous production
Unit 4: Product sustainability and Social issues To Develop, demonstrate and apply knowledge and understanding of the environmental and social impact of new products. The affects Continuous Improvement of Products on the Environment, Product Life Cycle Analysis, The 6 R's Social Footprint	**Unit 10: Metals and alloys** To develop, demonstrate and apply knowledge and understanding of metals and alloys Ferrous Metals, Non-Ferrous Metals, Alloys, High Speed Steel, Brass, Stainless Steel	**Unit 20: Quality control** To develop, demonstrate and apply knowledge and understanding of Quality Control Quality Control, Tolerance, Quality Control Tests, Achieving consistency during manufacturing, Depth stops on drill, Programming Laser Cutters, PCB exposure times

Unit 5: Products in society To Develop, demonstrate and apply knowledge and understanding of how new technology can impact enterprise, people, culture and society as a whole. Entrepreneurs, Crowd Funding, Virtual Marketing and Retail, Co-operatives, Fairtrade, Market Pull, Technology Push, Technology and Its Effects on the Jobs We Do, Impact of Technology on Culture, Impact of Technology on Society	**Unit 11: Polymers** To develop, demonstrate and apply knowledge and understanding of polymers Thermoforming (thermoplastic) Thermosetting	**Unit 21: Production aids** To develop, demonstrate and apply knowledge and understanding of methods to aid production and control accuracy Reference Points, Templates, Patterns, Jigs .
Unit 6: Powering systems To Develop, demonstrate and apply knowledge and understanding of how energy is created and the affect it has on the environment. Fossil Fuels (Non-renewable), Nuclear Power, Green Energy (Renewable), Drive for More Renewable Energy, Storing Energy, Batteries	**Unit 12: Textiles** To develop, demonstrate and apply knowledge and understanding of textiles, both natural and synthetic. Natural fibres, Synthetic Fibres, Fibres and yarns, Woven Yarns, Knitted Yarns, Non-woven fibres, Blending and Mixing	**Unit 22: Production of materials** To develop, demonstrate and apply knowledge and understanding of where materials come from and how they are processed Paper and Board from cellulose fibres, Wood for timber, Metals from rocks Plastics from Oils, Fibres from natural sources, Regenerated fibres, Synthetic fibres, Impact on the environment
	Unit 13: Manufactured boards To develop, demonstrate and apply knowledge and understanding of manufactured boards Medium Density Fibre Board, Plywood, Chipboard	**Unit 23: Designing and making** To develop, demonstrate and apply knowledge and understanding of design strategies and techniques. The work of others – Designers and design movements, The work of others – Companies , Design Briefs and Specification, Market research, Product analysis, Design strategies, Exploring and developing a design idea, Drawing Techniques, More on Drawing Techniques
	Unit 14: Electronic systems To develop, demonstrate and apply knowledge and understanding of electronic systems Input, process, output, Circuits, Input devices in electronic systems, Switches and Variable resistors, Thermistors, Light-dependent resistors, Pressure Sensors, Processing, Integrated Circuits, Microcontrollers	Introduction to the NEA Contextual Challenges become Live

	Programmed microcontrollers, Microcontrollers as timers and counters Microcontrollers as decision-makers, Output devices	
	Unit 15: Mechanical systems To develop, demonstrate and apply knowledge and understanding of mechanical systems Changing the magnitude and direction of force Types of motion, Levers, First class levers, Second class levers, Third class levers, Linkages, Gears, Pulleys, Belt Drives, Cams, Circular Cams, Snail Cams, Pear Cams, Four-lobed Cams	**Unit 24: Specialist principles - Polymers** Sources and origins of polymers Properties of polymers Stock forms, types and sizes Specialist techniques and processes Surface treatments and finishes
	Unit 16: Developments in new materials To develop, demonstrate and apply knowledge and understanding of modern materials Graphene, Metal Foams, Titanium, Liquid Chrystal Displays (LCDs), Coated Materials, Nanomaterials, Smart Materials, Composites, Technical Textiles	**Unit 25: Specialist principles- Timbers** Sources and origins of timbers Properties of timbers Stock forms, types and sizes Specialist techniques and processes Surface treatments and finishes

Year 11 Sequencing

Due to the nature of the Design course, the focus of the Autumn and Spring terms for year 11 focus primarily on the NEA element. This equates to 50% of the entire course and therefore sufficient time must be allocated to allow it to be effectively delivered and managed. This time must include all necessary teaching inputs, practical inputs and safety demonstrations to successfully facilitate independent project work. These cannot be planned in advance as they will vary dramatically for individual pupils and the varying demands of the annually launched contextual challenges.

Rationale from AQA:

The Non-exam assessment will contribute towards 50% of the students overall mark. The NEA project in its entirety should take between 30–35 hours to complete and consist of a working prototype and a concise portfolio of approximately 20 pages of A3 paper, equivalent A4 paper or the digital equivalent. Students' work should consist of an investigation into a contextual challenge, defining the needs and wants of the user and include relevant research to produce a design brief and specification. Students should generate design ideas with flair and creativity and develop these to create a final design solution (including modelling). A manufacturing specification should be produced to conclude your design findings leading into the realisation of a final prototype that is fit for purpose and a final evaluation. Students should investigate, analyse and evaluate throughout the portfolio and evidence all decisions made. Six criteria are produced for assessment and there are a number of points within each. Each band should be viewed holistically when marking assessments. Students who produce no work for a criterion or work that is below a GCSE standard should be awarded zero. The criteria should not be viewed as a linear process to be followed in a step-by-step manner. Rather, students should be encouraged to follow the iterative design process and assessors encouraged to award marks where they are deserved and can be evidenced. You should ensure that the criteria are assessed accurately and students are not rewarded for quantity of work but the quality of work produced. With the assessment process being viewed holistically it's vital that students clearly record their work so it is clear where the marks can be awarded. It's also essential that teachers provide clear annotation to support their assessments.

Project running order:

Section A: Identifying & investigating design possibilities (10 marks)

By analysing the contextual challenge students will identify design possibilities, investigate client needs and wants and factors including economic and social challenges. Students should also use the work of others (past and/or present) to help them form ideas. Research should be concise and relate to their contextual challenge. Students are also advised to use a range of research techniques (primary/secondary) in order to draw accurate conclusions. Students should be encouraged to investigate throughout their project to help inform decisions.

Section B: Producing a design brief & specification (10 marks)

Based on conclusions from their investigations students will outline design possibilities by producing a design brief and design specification. Students should review both throughout the project.

Section C: Generating design ideas (20 marks)

Students should explore a range of possible ideas linking to the contextual challenge selected.

These design ideas should demonstrate flair and originality and students are encouraged to take risks with their designs. Students may wish to use a variety of techniques to communicate.

Students will not be awarded for the quantity of design ideas but how well their ideas address the contextual challenge selected. Students are encouraged to be imaginative in their approach by experimenting with different ideas and possibilities that avoid design fixation. In the highest band students are expected to show some innovation by generating ideas that are different to the work of the majority of their peers or demonstrate new ways of improving existing solutions.

Section D: Developing design ideas (20 marks)

Students will develop and refine design ideas. This may include, formal and informal 2D/3D drawing including CAD, systems and schematic diagrams, models and schedules. Students will develop at least one model, however marks will be awarded for the suitability of the model(s) and not the quantity produced. Students will also select suitable materials and components communicating their decisions throughout the development process. Students are encouraged to reflect on their developed ideas by looking at their requirements; including how their designs meet the design specification. Part of this work will then feed into the development of a manufacturing specification

providing sufficient accurate information for third party manufacture, using a range of appropriate methods, such as measured drawings, control programs, circuit diagrams, patterns, cutting or parts lists.

Section E: Realising design ideas (20 marks)

Students will work with a range of appropriate materials/components to produce prototypes that are accurate and within close tolerances. This will involve using specialist tools and equipment, which may include hand tools, machines or CAM/CNC. The prototypes will be constructed through a range of techniques, which may involve shaping, fabrication, construction and assembly. The prototypes will have suitable finish with functional and aesthetic qualities, where appropriate.

Students will be awarded marks for the quality of their prototype(s) and how it addresses the design brief and design specification based on a contextual challenge.

Section F: Analysing & evaluating (20 marks)

Within this iterative design process students are expected to continuously analyse and evaluate their work, using their decisions to improve outcomes. This should include defining requirements, analysing the design brief and specifications along with the testing and evaluating of ideas produced during the generation and development stages. Their final prototype(s) will also undergo a range of tests on which the final evaluation will be formulated. This should include market testing and a detailed analysis of the prototype(s).

Independent study topics:

Stock forms and standard components
More standard components
Shaping materials - hand tools
Shaping materials - power and machine tools
Shaping techniques
Moulding and joining
Treatment and Finishes