KS4 Curriculum Map – Design and Technology:

Topic	Knowledge *Substantive knowledge*: This is the specific, factual content for the topic, which should be connected into a careful sequence of learning.	Skills *Disciplinary knowledge*: This is the action taken within a particular topic in order to gain substantive knowledge.	Assessment Opportunities What assessments will be used to measure student progress?
Introduction to course	• AQA for GCSE Design and Technology • How it's assessed Paper 1 • Section A – Core technical principles • Section B – Specialist technical principles • Section C – Designing and making principles	• Outline: • Core technical principles • Specialist technical principles • Designing and making principles • At least 15% of the exam will assess maths • At least 10% of the exam will assess science.	• Question and Answers • SMSC evaluation on product/idea. • Metacognition application at the end of the
New and emerging technologies	• Industry and enterprise • Sustainability • People, Culture and Society • Production techniques and systems • Informing design decisions	• Enterprise based on the development of an effective business innovation eg crowd funding, virtual marking, co-operatives and fair trade. • The impact of resource consumption on the planet: finite, non-finite and disposal of waste. • How technology push/market pull affects choice. Changing job roles due to the emergence of new ways of working driven by technological change. • How products are designed and made to avoid having a negative impact on others: design for disabled, elderly and different religious groups. • Positive and negative impacts new products have on the environment: continuous	• Question and Answers verbal • AQA GCSE Design and Technology Q&A from book • Exam Pro questions • Green pen evaluation • Technologystudent.com Q&A

		improvement, efficient working, pollution and global warming. • The contemporary and potential future use of: automation, computer aided design, computer aided manufacture, flexible manufacturing systems, just in time and lean manufacturing. • That it is important to consider scenarios from different perspectives and considering: planned obsolescence, design for maintenance, ethics and the environment.	
Energy generation, storage, materials, systems and devices	• Fossil fuels, Nuclear power, • Renewable energy • Energy storage systems including batteries • Modern materials • Smart materials • Composite materials • Technical textiles • Systems approach to designing	• How power is generated from: coal, gas and oil. Arguments for and against the selection of fossil fuels. • How nuclear power is generated. Arguments for and against the selection of nuclear power. • How power is generated from: wind, solar, tidal, hydro-electrical, biomass. Arguments for and against the selection of renewable energy. • Kinetic pumped storage systems. Alkaline and re-chargeable batteries. • Developments made through the invention of new or improved processes eg Graphene, Metal foams and Titanium. Alterations to perform a particular function eg Coated metals, Liquid Crystal Displays (LCDs) and Nanomaterials. • That materials can have one or more properties that can be significantly changed in a controlled fashion by external stimuli, such as stress, temperature, moisture, or PH eg shape memory alloys, thermochromic pigments and photochromic pigments. • That composite materials are produced by combining two or more different materials to create an enhanced material eg glass	• Question and Answers verbal • AQA GCSE Design and Technology Q&A from book • Exam Pro questions • Green pen evaluation • Technologystudent.com Q&A

		reinforced plastic (GRP) and carbon fibre reinforced plastic (CRP). • How fibres can be spun to make enhanced fabrics eg conductive fabrics, fire-resistant fabrics, kevlar and microfibres incorporating micro encapsulation. • Inputs, Processes and Outputs	
Materials and their working properties	• Papers and boards • Natural and manufactured timbers (Grabber Project) • Metals and alloys (Lamp Project) • Polymers • Textiles • Material properties	• Students should have an overview of the main categories and types of papers and boards: papers including: bleed proof, cartridge paper, grid, layout paper, tracing paper boards including: corrugated card, duplex board, foil lined board, foam core board, ink jet card and solid white board. • Timber based materials: planks, boards and standard moldings, sold by length, width, thickness and diameter, standard components eg woodscrews, hinges, KD fittings. • Metal based materials: sheet, rod, bar and tube, sold by length, width, thickness and diameter, standard components eg rivets, machine screws, nuts, and bolts. • Polymers: sheet, rod, powder, granules, foam and films, sold by length, width, gauge and diameter, standard components eg screws, nuts and bolts, hinges. • Textile based materials: yarns and fabrics, sold by roll size, width, weight and ply standard components eg. zips, press studs, velcro.	• Question and Answers verbal • AQA GCSE Design and Technology Q&A from book • Exam Pro questions • Green pen evaluation • Technologystudent.com Q&A • BBC Bitesize

The works of others The work of companies	• The work of others • 12 new, diverse designers • The work of companies	• Students should investigate the work of a minimum of two of the following designers: Aldo Rossi, Charles Rennie Macintosh, Ettore Sottsass, Gerrit Reitveld, Harry Beck, Louis Comfort Tiffany, Marcel Breuer, Norman Foster, Philippe Starck, Raymond Templier, Sir Alec Issigonis, William Morris. • New Diverse designers: Architect - David Adjaye, Multidisciplinary artist - Yinka Ilori, Female Architect - Zaha Hadid, Female Architect - Elsie Owusu, Egyptian industrial designer - Karim Rashid, British born Ghanaian designer - Kusheda Mensah, Female multidisciplinary designer based in Dubai - Aljoud Lootah, Female Artist & Designer - Morag Myerscough, twin sisters Indian British artists - The Singh Twins • Students should investigate the work of a minimum of two of the following companies: Alessi, Apple, Braun, Dyson	• Question and Answers verbal • AQA GCSE Design and Technology Q&A from book • Exam Pro questions • Green pen evaluation • Technologystudent.com Q&A
Links to maths and science	• Arithmetic and numerical computation • Handling data • Graphs • Geometry and trigonometry • Use scientific vocabulary, terminology and definitions	• Recognise and use expressions in decimal and standard form. Use ratios, fractions and percentages. Calculate surface area and volume. • Presentation of data, diagrams, bar charts and histograms. • Plot, draw and interpret appropriate graphs. Translate information between graphical and numeric form. • Use angular measures in degrees. Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. Calculate areas of triangles and rectangles, surface areas and volumes of cubes. • Quantities, units and symbols. • SI units (eg kg, g, mg; km, m, mm; kJ, J), prefixes and powers of ten for orders of magnitude (eg tera, giga, mega, kilo, centi, milli, micro and nano).	• PG online resources • AQA past papers • ExamPro question • Question in Examination: • Work through examples. • Question testing since 2019. • Work through formulas. • *Maths requirements and science are all met within the school.*

		• Metals and non-metals and the differences between them, on the basis of their characteristic physical and chemical properties.	
Grabber project	• Mechanical devices • Different types of movement • Changing magnitude and direction of force • Woodwork hand tools- Chisel, Mallet, Marking gauge and Cutting tools. • CAD / CAM designing and making • Prototyping cardboard • Natural and manufactured timbers • Ergonomics and Anthropometrics	• The functions of mechanical devices to produce linear, rotary, reciprocating and oscillating movements. • Levers: first order, second order and third order. • Linkages: bell cranks and push/pull. • Rotary systems: CAMs and followers, simple gear trains, pulleys and belts. • Practical skills Chiseling, Cutting, Drilling, gluing and adding linkages. • Computer Aided Design / Computer Aided Manufacture – Laser cutting parts. • Students should have an overview of the main categories and types of natural and manufactured timbers: hardwoods including: ash, beech, mahogany, oak and balsa softwoods including: larch, pine and spruce manufactured boards including: medium density fibreboard (MDF), plywood and chipboard. • Wood Stock forms, types and sizes • Wood Scales of production. • Surface treatments and finishes. • Materials and objects can be manipulated to resist and work with forces and stresses: Tension, compression, bending, torsion and shear.	• Question and Answers verbal • AQA GCSE Design and Technology Q&A from book • Exam Pro questions • Green pen evaluation • Pear assessing • Technologystudent.com Q&A • Assessment paper

Lamp Project	• Metals and alloys • Jigs and formers • Electronics components • Forming natural wood	• Students should have an overview of the main categories and types of metals and alloys: ferrous metals including: low carbon steel, cast Iron, high carbon/tool steel • Non ferrous metals including: aluminum, copper, tin and zinc • alloys including: brass, stainless steel and high speed steel. • Metal Stock forms, types and sizes • Metal Scales of production	• Question and Answers verbal • AQA GCSE Design and Technology Q&A from book • Exam Pro questions • Green pen evaluation • Pear assessing • Technologystudent.com Q&A • Assessment paper
PROJECT Phone Holder	• Polymers • Practical skills. • Material understanding. • CAD design – 2D Design Fusion 360. • Laser cutting.	• Students should have an overview of the main categories and types of polymers: thermoforming including: acrylic (PMMA), high impact polystyrene (HIPS), high density polythene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyethylene terephthalate (PET) thermosetting including: epoxy resin (ER), melamine-formaldehyde (MF), phenol formaldehyde (PF), polyester resin (PR) and urea-formaldehyde (UF). • Polymers Stock forms, types and sizes • Polymers Scales of production	• Question and Answers verbal • AQA GCSE Design and Technology Q&A from book • Exam Pro questions • Green pen evaluation • Pear assessing • Technologystudent.com Q&A • Assessment paper
PROJECT Paper and Board	• Practical skills. • Material understanding. • Die cutting. • Lamination. • Making paper.	• Physical and working properties. • Sources and origins. • Commonly available forms. • Manipulating and joining. • Structural integrity. • Making iterative models. • Finishes.	• Project approach (D&M). • Paper making. • Chair design / structures. • Iterative process followed. • Presentation skills.

NEA Major Project	• non-exam assessment • Design strategies • Communication of design ideas • Prototype development • Material management • Specialist tools and equipment – Laser cutter, CNC router and 3D printer are some examples. • CAD 2D Design and Fusion 360	• non-exam assessment will measure how students have achieved the following assessment objectives. • AO1: Identify, investigate and outline design possibilities to address needs and wants. AO2: Design and make prototypes that are fit for purpose. AO3: Analyse and evaluate: design decisions and outcomes, including for prototypes made by themselves and others, wider issues in design and technology. AO4: Demonstrate and apply knowledge and understanding of: technical principles, designing and making principles. • How this can be done using an iterative process including: sketching, modelling, testing, evaluation of their work to improve outcomes. • Develop, communicate, record and justify design ideas using a range of appropriate techniques. • Design and develop prototypes in response to client wants and needs. Note the term prototype can be used to describe either a product or system. How the development of prototypes: The importance of planning the cutting and shaping of material to minimise waste eg nesting of shapes and parts to be cut from material stock forms • How to select and use specialist tools and equipment, including hand tools, machinery	• AQA GCSE Design and Technology Q&A from book • Give Exam Pro questions when linked to paper. • Technologystudent.com Q&A • Give students AQA Assessment marking criteria of each section • Feedback is generic to meet OFQUAL regulations

NEA AO1 (Section A) Investigations of the context	• Section A: • AO1: Identify, investigate and outline design possibilities to address needs and wants. • (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.	• All work submitted in drop box. • Give AQA Marking criteria Section A to students. • Deadlines set for each section. • Feedback is generic to meet OFQUAL regulations
NEA AO1 (Section A) Investigations of the context	• Key areas for students to investigate	• Design possibilities identified and thoroughly explored, directly linked to a • Contextual challenge demonstrating excellent understanding of the • Problems/opportunities. • A user/client has been clearly identified and is entirely relevant in all aspects • To the contextual challenge and student has undertaken a comprehensive • Investigation of their needs and wants, with a clear explanation and • Justification of all aspects of these. • Comprehensive investigation into the work of others that clearly informs ideas. • Excellent design focus and full understanding of the impact on society including; economic and social effects.	• All work submitted in drop box. • Deadlines set for each section. • Feedback is generic to meet OFQUAL regulations

NEA AO1 (Section B) Outline design possibilities	• Section B: • Producing a design brief and 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.	• All work submitted in drop box. • Give AQA Marking criteria Section B to students. • Deadlines set for each section. • Feedback is generic to meet OFQUAL regulations
NEA AO1 (Section B) Outline design possibilities	• Key areas for students to write brief and specification	• Comprehensive design brief which clearly justifies how they have considered their user/client's needs and wants and links directly to the context selected. • Comprehensive design specification with very high level of justification linking to the needs and wants of the client/user. • Fully informs subsequent design stages.	• All work submitted in drop box. • Deadlines set for each section. • Feedback is generic to meet OFQUAL regulations
NEA A02 Design and make prototypes that are fit for purpose	• 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.	• All work submitted in drop box. • Deadlines set for each section. • Give AQA Marking criteria Section C to students. • Feedback is generic to meet OFQUAL regulations

NEA A02 Design and make prototypes that are fit for purpose	• Key areas for students when generating design ideas.	• Imaginative, creative and innovative ideas have been generated, fully avoiding design fixation and with full consideration of functionality, aesthetics and innovation. • Ideas have been generated that take full account of ongoing investigation that is both fully relevant and focused. • Extensive experimentation and excellent communication is evident, using a wide range of techniques. • Imaginative use of different design strategies for different purposes and as part of a fully integrated approach to designing.	• All work submitted in drop box. • Deadlines set for each section. • Feedback is generic to meet OFQUAL regulations
NEA A02 Design and make prototypes that are fit for purpose	• 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.	• All work submitted in drop box. • Give AQA Marking criteria Section D to students. • Deadlines set for each section. • Feedback is generic to meet OFQUAL regulations

NEA A02 Design and make prototypes that are fit for purpose	• Key areas for students when developing design ideas.	• Very detailed development work is evident, using a wide range of 2D/3D techniques (including CAD where appropriate) in order to develop a prototype. • Excellent modelling, using a wide variety of methods to test their design ideas, fully meeting all requirements. • Fully appropriate materials/components selected with extensive research into their working properties and availability. • Fully detailed manufacturing specification is produced with comprehensive justification to inform manufacture.	• All work submitted in drop box. • Deadlines set for each section. • Feedback is generic to meet OFQUAL regulations
NEA A02 Design and make prototypes that are fit for purpose	• 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.	• All work submitted in drop box. • Deadlines set for each section. • Give AQA Marking criteria Section E to students. • Feedback is generic to meet OFQUAL regulations

NEA A02 Design and make prototypes that are fit for purpose	• Key areas for students when realising design ideas.	• The correct tools, materials and equipment (including CAM where appropriate) have been consistently used or operated safely with an exceptionally high level of skill. • A high level of quality control is evident to ensure the prototype is accurate by consistently applying very close tolerances. • Prototype shows an exceptionally high level of making/finishing skills that are fully consistent and appropriate to the desired outcome. • An exceptionally high quality prototype that has the potential to be commercially viable has been produced and fully meets the needs of the client/user.	• All work submitted in drop box. • Deadlines set for each section. • Feedback is generic to meet OFQUAL regulations
NEA A03 Analyse and evaluate	• Section F: • Analysing and 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).	• All work submitted in drop box. • Deadlines set for each section. • Give AQA Marking criteria Section F to students. • Feedback is generic to meet OFQUAL regulations
NEA A03 Analyse and evaluate	• Key areas for students when analysing and evaluating work.	• Extensive evidence that various iterations are as a direct result of considerations linked to testing, analysis and evaluation of the prototype, including well considered feedback from third parties. • Comprehensive testing of all aspects of the final prototype against the design brief and	• FINAL NEA SUBMISSION • Students given score out of 100.

		specification. Fully detailed and justified reference is made to any modifications both proposed and undertaken. • Excellent ongoing analysis and evaluation evident throughout the project that clearly influences the design brief and the design and manufacturing specifications.	
PPE 1	• Exam opportunity • Hyperlinks to area to revise • Understanding of AQA style questions in each section	• Focused revision session. Provide learners with focused and supported revision that allows them to review their collated and developed revision materials, and to use these to prepare for a practice test. • Review examiners report	• Complete mock examination paper. • Analysis of results • 1to1 as required • Predicted grades
PPE 2	• Exam opportunity • Hyperlinks to area to revise • Understanding of AQA style questions in each section	• Marked against examination criteria. • Predicted grades can be set with NEA overview at this stage. • Review examiners report	• Full examination in test conditions. • Data analysis of results. • (Paper is stored by teacher).
Examination preparation	• Section C responses. • Section B responses. • Section A responses.	• How to answer questions in depth. • Using the MARK scheme for past papers.	• PPE 1&2. • Example answers. • Previous test papers.