St Cecilia's R. C. High School

Key Stage 1 and 2

Aims of Study

Design and technology is an inspiring, rigorous and practical subject. Using creativity and imagination, pupils design and make products that solve real and relevant problems within a variety of contexts, considering their own and others' needs, wants and values. They acquire a broad range of subject knowledge and draw on disciplines such as mathematics, science, engineering, computing and art. Pupils learn how to take risks, becoming resourceful, innovative, enterprising and capable citizens. Through the evaluation of past and present design and technology, they develop a critical understanding of its impact on daily life and the wider world. High-quality design and technology education makes an essential contribution to the creativity, culture, wealth and well-being of the nation

Key Substantive Knowledge Carried Forward (subject knowledge)

Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts [for example, the home, school, leisure, culture, enterprise, industry and the wider environment.

- **Design**

Use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design

- **Make**

Select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities

- **Evaluate**

investigate and analyse a range of existing products, evaluate their ideas and products against their own design criteria and consider the views of others to improve their work. Understand how key events and individuals in design and technology have helped shape the world

- **Technical knowledge.**

Apply their understanding of how to strengthen, stiffen and reinforce more complex structures. Understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages] Understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers and motors]. Apply their understanding of computing to program, monitor and control their products.

Year 7

Unit Title	***Working with wood***	***Designing by hand and CAD***	***Working with plastic***	***Mechanical systems***
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	• What are the 3 main types of wood? • What are the key properties of different types of wood? • What are the main tools and equipment used when working with wood?	• The different drawing methods used within Design Technology – basic introduction (Isometric / perspective) • What is CAD / CAM and the benefits • Understand the work of other designers and the roles they play on developing a product	• What are the 2 main types of plastic? • What are the key properties of different types of plastic? • What are the main tools and equipment used when working with plastic? • Impact of plastic on society	• What is a simple machine? • How simple machines are used within everyday life to make tasks easier • What are the different types of motion and how are they applied?
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	**Materials theory – Wood** • Introduction to timbers • Sources and uses • Where wood comes from Different types of wood and any uses for it **Block Bot – Practical** • Introduction to workshop safety • Tools and equipment used • Measuring and marking out • Cutting and shaping • Finishing **Product Test – Teacher Specification** • Testing their Block Bot against a given set of criteria	**Designing – Isometric** • Introduction to drawings techniques • Isometric and 3D cubes introduction • Complex 3D shapes • Different techniques of drawing. Sketching / Crating / Oblique / Isometric • What is a 3D shape? How to draw cubes and simple shapes Crating and curved shapes **2D Design – Simple Ruler** • Introduction to CAD (Advantages and disadvantages) • Using 2D Design • Laser cutter **Designer Case Study** • Famous designers • Work of designers • Uses and applications of designs	**Materials theory – Plastic** • Introduction to plastics • Sources and uses • Where plastic comes from Different types of plastic and any uses for them **Key Fob – Practical** • Recap workshop safety • Tools and equipment used • Layering plastic • Designing – Scruffiti • Cutting and shaping • Finishing **Energy / Environment – Plastics Non-Renewables (Bag)** • Non-renewable sources • Plastic impact • Designing logo • Sub printing bag	**Mechanical Systems – Levers (Simple Machines)** • 6 simple machines ○ Lever ○ Screw ○ Ramp ○ Wheel ○ Pulley • Uses and functions • Simple lever (Card modelling) **Cardboard Levers and Linkages** • Types of motion • Rotary • Reciprocating • Oscillating • Linear • Manufacturing levers and linkages (grabber project)

Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Use of specialist tools and equipment: • Try square • Steel ruler (Measuring in mm) • Tenon saw • Pillar drill • Band facer Marking and measuring Cutting timber Health and safety key concepts working in a workshop NC links: • Use research and exploration, such as the study of different cultures, to identify and understand user needs • Identify and solve their own design problems and understand how to reformulate problems given to them • Select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture • Select from and use a wider, more complex range of materials, components and ingredients, taking into account their properties • Test, evaluate and refine their ideas and products against a specification, taking into account the views of intended	• Different techniques of drawing. Sketching / Crating / Oblique / Isometric • What is a 3D shape? • How to draw cubes and simple shapes • Crating and curved shapes NC Links: • Develop and communicate design ideas using annotated sketches • Develop and communicate design ideas using detailed plans • Develop and communicate design ideas using 3-D and mathematical modelling • Develop and communicate design ideas using computer-based tools • Understand developments in design and technology, its impact on individuals, society and the environment	• Marking out on plastic • Cutting plastic • Health and safety key concepts working in a workshop • Environmental impact of plastic use / manufacturing NC links: • Use research and exploration, such as the study of different cultures, to identify and understand user needs • Identify and solve their own design problems and understand how to reformulate problems given to them • Select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture • Select from and use a wider, more complex range of materials, components and ingredients, taking into account their properties • Test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interested groups	• Different types of motion • Use of machines in everyday life • How to work with cardboard and model • Use of linkages in machines NC links: • Understand how more advanced mechanical systems used in their products enable changes in movement and force • Understand and use the properties of materials and the performance of structural elements to achieve functioning solutions • Understand how more advanced mechanical systems used in their products enable changes in movement and force

	users and other interested groups			
Examples of Reading Opportunity	• Worksheets • Information used on PowerPoints • Step by step guides used when making	• Worksheets • Information used on PowerPoints	• Worksheets • Information used on PowerPoints • Step by step guides used when making	• Worksheets • Information used on PowerPoints
Examples of Key Tier 2 Vocabulary	• Timber • Safety • Marking • Measuring • Cutting • Sawing • Trees	• Design • Drawing • Sketching • Curved • Vertical • Horizontal	• Oil • Plastic • Safety • Marking • Measuring • Cutting • Sawing • Waste	• Lever • Machine • Linkage • Motion • Ramp • Wheel • Pulley • Use
Examples of Key Tier 3 Vocabulary	• Finishing • Origins • Accuracy • Tolerance • Sustainability • Coniferous • Deciduous	• Oblique • Isometric • Computer Aided Design • Dimensions • Application • Tolerance • Commercial	• Biodegrade • Finite • Sustainability • Pollution • Commercial • Social footprint • Origin • Accuracy • Tolerance	• Function • Oscillation • Rotary • Linear • Reciprocating • Function
Examples of Numeracy	• Converting CMs to MM • Calculating distance • Use of ruler to read numbers and measurements	• Angles of drawings • Measuring lines for drawing • Mathematical modelling	• Converting CMs to MM • Use of ruler to read numbers and measurements	• Speed of machines • Numbers in gears • Weights being moved / lifted

Year 8

Unit Title	***Working With Composites***	***Designing For Others***	***Energy and Electronics***	***Structural Systems***

Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	• What are the different types of composite materials? • What are the key properties of different types of composites? • What are the main tools and equipment used when working with composites? • What are composite materials used for?	• Firm understanding of isometric and perspective drawing • How to develop shapes using crating • Complex tone and rendering • Understanding of CAD / CAM to further develop 2D Design skills • Understanding of inclusive design and the work of others	• Understanding circuit symbols and different types of electronic circuits • How technology has changed / the importance of technology push and market pull • Understanding how energy is created using renewable and non renewable sources.	• Understanding of what is a structure and where they are used • Know the different types of structures • Know the different shapes used in structures • What are cams and followers and how are they used • How linkages connect together to creating working mechanisms
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	**Materials theory – Composites** • Introduction to composites - types • Sources • Product used in • Linked back to core material knowledge **Desk Tidy – Practical** • Recap workshop safety (Year 7) • Tools and equipment used • Marking out using templates • Cutting and shaping plywood (Composite) • Finishing and designing **Product Test – Teacher Specification** • How to create a working criteria for a product • Testing design against the criteria	**Designing – Isometric / Rendering** • Recap Isometric drawing style (Y7) • Crating and complex isometric shapes • Introduction to rendering – light / shade / tone • Assessment – Camera (Isometric and render) • Different techniques of drawing. Sketching / Crating / Oblique / Isometric • How to draw cubes and simple shapes Crating and curved shapes **2D Design – Maze** • Recapping 2D Design tools and equipment • Recapping CAD (Advantages and disadvantages)	**Electronics** • What is electricity? • Current / Resistance / Voltage • Complex circuit symbols • Drawing circuits • Making simple circuits • Looking at existing products and fault finding • General understanding of health and safety and how to stay safe in a workshop environment **Emerging Technology** • Developments in technology • How technology has changed • Extended answer question • What is a car? How does it work? Changes and developments?	**Theory – Structural Systems** • Recap Y7 structures knowledge • Introduction to structural systems • Functions and examples • Shapes and uses • Prior knowledge and use of: • Lever / Screw / Ramp / Wheel / Pulley • What is a structure? – knowledge of buildings and bridges • Working with cardboard to make simple shapes and working to measurements **Bridge / Tower Building – Practical** • Bridge building practical – Design and ideas (Teamwork) • Tower building practical – Design and ideas (Teamwork) **Linkages / Cams and Followers – Practical** • Recap Y7 linkages and motion knowledge • Different linkages and uses

		• Introduction to CAM – Using the laser cutter • Complex shapes and layering • Use of a computer to save and open files • What is a laser cutter? • CAD knowledge (Advantages and disadvantages) **Materials Theory – Smart Materials** • Introduction to Smart Materials • Sources and uses **Big Life Fix – User Design** • Inclusive Design • Watch Big Life Fix documentary • Investigation of products used to help people with disabilities **Designer Case Study** • Famous designers • Work of designers • Uses and applications of designs	• Use of some new technology to manufacture and run • How products changed Materials knowledge **Energy / Environment – Renewable Energy** • Renewable energy source • Wind and solar power practical • Design activity – energy related • Paper / card modelling • What are the ads and disadvantages of renewables? • Understanding solar (Science) / Tidal / Biomass / Wind • News and impacts on current and modern life? • Card modelling techniques. • How to be safe in a workshop	• Introduction to cams and followers • Linking back to Y7 motion: Rotary / Reciprocating / Oscillation / Linear • Use of cams and followers in modern machines • Cutting and marking on cardboard
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	Use of specialist tools and equipment: ○ Try square ○ Steel ruler (Measuring in mm) ○ Tenon saw ○ Pillar drill ○ Band facer	• Different techniques of drawing. Sketching / Crating / Oblique / Isometric • What is a 3D shape? • How to draw cubes and simple shapes effectively	• How to connect electronic components together – Soldering / breadboard / conductive dough • How energy impacts on to the environment	• Understand how the 6 simple machines function • Understand what a structure is and the strongest shapes for structures • Understand how motion transfers

	○ Coping saw ○ Laser cutter • How to mark and measuring on to materials • Cutting composite material • Health and safety key concepts working in a workshop NC Links: • Identify and solve their own design problems and understand how to reformulate problems given to them • Select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture • Select from and use a wider, more complex range of materials, components and ingredients, taking into account their properties • Test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interested groups	• Crating and curved shapes in detail • How to use CAD software effectively with complex shapes • How to write a specification • How to design for others given a brief NC Links: • Develop and communicate design ideas using annotated sketches • Develop and communicate design ideas using detailed plans • Develop and communicate design ideas using 3-D and mathematical modelling • Develop and communicate design ideas using computer-based tools • Understand developments in design and technology, its impact on individuals, society and the environment	• Critical thinking of advantages and disadvantages • Card modelling techniques • Safety in the workshop • Understanding how renewable energies work NC Links: • Apply computing and use electronics to embed intelligence in products that respond to inputs [for example, sensors], and control outputs [for example, actuators], using programmable components [for example, microcontrollers] • Understand how more advanced electrical and electronic systems can be powered and used in their products [for example, circuits with heat, light, sound and movement as inputs and outputs]	• Use of basic card modelling tools and techniques • Workshop safety when modelling NC Links: • Understand how more advanced mechanical systems used in their products enable changes in movement and force • Understand and use the properties of materials and the performance of structural elements to achieve functioning solutions • Understand how more advanced mechanical systems used in their products enable changes in movement and force
Examples of Reading Opportunity	• Worksheets • Information used on PowerPoints • Step by step guides used when making	• Worksheets • Information used on PowerPoints	• Worksheets • Information used on PowerPoints • Step by step guides used when making	• Worksheets • Information used on PowerPoints • Step by step guides used when making

Examples of Key Tier 2 Vocabulary	• Composite • Sources • Safety • Marking • Measuring • Cutting • Sawing • Mixing	• Design • Drawing • Sketching • Curved • Complex • Oblique • Vertical • Horizontal • Isometric • CAD • Disabilities	• Sources • Energy • Environment • Generation • Power • Turbine • Technology • Electronics • Circuits • Storage	• Building • Structure • Load • System • Function • Shape • Machine • Lever • Motion • Cam and Follower • Forces
Examples of Key Tier 3 Vocabulary	• Finishing • Origins • Accuracy • Tolerance • Sustainability • Application • Reinforcement • Strengthen	• Dimensions • Application • Tolerance • Commercial • Inclusive • Exclusive • Social • Manufacture • Investigation • Ergonomics	• Sustainability • Impact • Schematic • Renewable • Finite • Infinite • Development • Emerging • Functionality • Technology Push • Market Pull	• Linkages • Reciprocating • Oscillating • Linear • Rotational • Withstand • Structural Systems • Deformation • Mechanics • Compression • Tension • Torsion

Year 9

Unit Title	***Working with mixed materials***	***Designing for the built environment***	***Industry and enterprise***	***STEM***

Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	• What are the different types of materials? Recapping woods, metals, plastics, smart materials and composites. • What are the key properties of different types of materials from different categories? • What are the main tools and equipment used when working with different material? • What are different materials used for?	• Firm understanding of all different drawing techniques – isometric, perspective and orthographic • How to develop products using different techniques • Complex tone and rendering to apply material finishes • Understanding of CAD / CAM to further develop 3D Design skills linked to architecture • Understanding work of designers and design movements	• What does the term enterprise mean and how is it applied within industry? • Working with a range of tools and materials to generate working products linked to a given design brief • How to write a specification for a product • What is renewable and non renewable energy? • What is sustainability and how does it link to the world around us and the products we use?	• Understanding the new developments in technology and how its affecting the products we use and buy • What is nano technology and robotics? • Understanding and recapping basic machines and levers • What are pneumatic and hydraulic systems and what are they used for? • What does STEM stand for? • What role does Engineering play on development of products and society?
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	**All Materials theory – General Application and uses (Multi materials) – Properties** • Recap general material applications • Recap material sources and uses • Mixed material products • General applications of materials in everyday (Research and evaluate) • Working and physical properties **Design Brief Project – Practical** • Recap workshop safety (Year 7/8) • Tools and equipment used in KS3 • Marking out using templates • Cutting and shaping materials • Laser cutting acrylic • Soldering and electronics • Finishing and final assembly using different fixing methods **Product Test – Teacher Specification** • Creating a criteria for their product based on clients needs • Testing design against the criteria and evaluating	**Designing Brief – Isometric / Rendering (Iteration)** • Recap Isometric drawing style (Y7/Y8) • Recap crating and complex isometric shapes • Recap rendering – light / shade / tone • Layering multiple shapes • Fine lining and presentation skills • Orthographic drawing • Designing for a criteria using mixed drawing methods **Designer case study** • Famous designers and design movements • Work of designers in these movements • Uses and applications of designs • Impact of designers on everyday products **CAD - SketchUp (Architecture)**	**Industry and enterprise** • Recap workshop safety (Year 7/8) • Tools and equipment used in KS3 • What is enterprise? • Designing and making products linked to a given design brief – linked to school / staff • What are design specifications and how to write them **Energy / Environment – Sustainability & Society** • Recap renewable and non-renewable sources • What is sustainability? • What are the 6R' • Linked to everyday product and how students can be more eco-friendly / aware • Product evaluations based on 6R's	**Emerging Technology – Robotics / Nano Tech** • Developments in technology (Recap Y7 /Y8) • What is robotics? How have they developed • What is Nano Tech? What does this mean for the future of technology • How have products developed over time • How to answer extended answer questions linked to new technologies **Hydraulic and Pneumatic Systems – Practical (Kit project)** • Recapping mechanisms, motion and levers – Simple machines • What is hydraulic? - Products and systems • What is Pneumatic? Uses and systems • Project kit assembly – Reading and following instructions

		• Introduction to 3D design using CAD • Recap CAD / CAM • Introduction to "The built environment" • Designing architectural models based on a brief / criteria		**<u>STEM Kit Project – Practical</u>** • Recap STEM knowledge • Project kit assembly – Reading and following instructions (Individual and team build tasks) • Quiz / Questions based on knowledge learned from the kits – Real world applications

Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	• Use of specialist tools and equipment:
	  ○ Try square
	  ○ Steel ruler (Measuring in mm)
	  ○ Tenon saw
	  ○ Pillar drill
	  ○ Band facer
	  ○ Coping saw
	  ○ Laser cutter
	• How to mark and measuring on to materials
	• Combining different materials using different fixing methods
	• Health and safety key concepts working in a workshop
		• How to apply different techniques of drawing. Sketching / Crating / Oblique / Isometric and orthographic
		• What is a CAD and 3D design?
		• Creating complex shapes and rendering to look like realistic materials
		• How to write a specification linked to a design brief
		• The work of existing designers and design movements – how they apply to design development
			• How products are developed and enterprise
			• How to write a design specification
			• Understanding what sustainability is and how it links to everyday products
			• Understanding the 6R's and how to develop products to meet the requirements
			• How to build a client profile and meet clients needs
				• Understanding how technology has developed and changed
				• Understanding automation and robotics
				• Understanding of pneumatics and hydraulics
				• How systems and mechanisms link together
				• Understanding of the key elements of STEM and the links to design technology

Examples of Reading Opportunity	• Worksheets • Information used on PowerPoints • Step by step guides used when making	• Worksheets • Information used on PowerPoints • Step by step guides used when making	• Worksheets • Information used on PowerPoints • Step by step guides used when making	• Worksheets • Information used on PowerPoints • Step by step guides used when making
Examples of Key Tier 2 Vocabulary	• Properties • Forces • Mixed • Combining • Working • Physical • Equipment • Template	• Design • Drawing • Sketching • Curved • Complex • Oblique • Vertical • Horizontal	• Sources • Energy • Environment • Generation • Power • Turbine • Technology • Reduce	• Technology • Design • Iterative • Nano • Robotics • Automation • System • Lever

	• Marking • Measuring • Cutting	• Isometric • CAD • Rendering • Shading	• Reuse • Recycle • Repair • Rethink • Refuse • Industry • Evaluation	• Linkage • STEM
Examples of Key Tier 3 Vocabulary	• Assembling • Specification • Development • Tolerance • Sustainability • Application • Reinforcement • Strengthen	• Built environment • Architecture • Orthographic • Specification • Development • Iterative	• Enterprise • Sustainability • Environmental • Impact • Schematic • Renewable • Finite • Infinite • Development • Emerging • Functionality • Technology Push • Market Pull	• Pneumatic • Hydraulic • Mechanisms • Assembling • Instructional

Year 10

Unit Title	***Materials and Properties Common Specialist Technical***	***Designing and Making Principles***	***Specialist Units***	***NEA***
Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	• What the course entails • What are the key content principles? • What are the different types of materials? Recapping woods, metals, plastics, smart materials and composites. • What are the key properties of different types of materials from different categories? • What are the main tools and equipment used when working with different material? • What are different materials used for?	• How to interpret data from primary and secondary sources • Understanding what a design brief is and how they are used • The key importance of the work of others and understand different designers and design movements • How to use design strategies to create ideas • How to develop a product based on a client profile • Use of tools and materials to prototype design ideas into workable models	• What is meant by the term enterprise? • How technology has impacted on people, culture, society and the environment • What is sustainability and how does this link to the 6Rs? • Understanding the different production techniques used in industry to make products • How we generate energy to power our lives • What do mechanical devices do and how do products work / function	• How to understand a design brief? • What is a client profile? • What is analysis? • How to analyse products / design briefs to help generate ideas
Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	**Materials and their properties** • Recap general material applications from KS3 • Recap material sources and uses (Linked to KS3) • Paper and board • Timbers • Metals • Polymers • Textiles • General of materials in everyday (Research and evaluate) • Working and physical properties of materials • Unit assessment **Phone Holder – Practical** • Recap workshop safety (KS3) – Risk assessment • Tools and equipment used in KS3 and introduction to new tools used in Engineering • Marking out • Timber joints	**Designing Principles** • Investigation – Primary and secondary data -Understand how primary and secondary data can be collected to assist the understanding of client and user needs • Know how to write a design brief and produce a manufacturing specification • The work of others – Designers - Understand how investigating the work of other designers can inform designing • The work of others – Companies - Understand how investigating the work of other design companies can inform designing • Designing strategies - Understand how to explore and develop design ideas • Unit assessment	**New and Emerging Technologies** • Industry and enterprise - Understand the impact of new and emerging technologies on the design and organisation of the workplace and tools and equipment • Sustainability and the environment - Understand how the environment can be protected by responsible design and manufacturing • positive and negative impacts new products have on the environment • People culture and society - Understand changes in job roles due to the emergence of new ways of working • Production techniques and systems - Understand how Just in Time (JIT) and Lean Manufacturing contribute to manufacturing efficiencies • Informing design decisions - Understand how products can be designed to be repaired and recycled	**NEA – June - Context released for the students** Run through the brief from the exam board and develop plan for the project and the possible design solutions • NEA introduction and initial research • NEA Research analysis • NEA Design ideas • NEA prototyping

	• Cutting and shaping • Filing and drilling • Vacuum forming • Laser cutting and line bending plastic • CNC vinyl cutting • Finishing and final assembly **<u>Common specialist technical principles</u>** • Forces and stresses • Improving functionality - Understand how materials may be enhanced to resist and work with forces and stresses to improve functionality • Ecological and social footprint • Six R's • Scales of production • Unit Assessment	**<u>Making principles</u>** • Selection of material and components - Understand how functionality, availability and cost affect the selection of materials and components • Tolerances – Understand what and how to ensure accuracy and what tolerance is applied • Material management – Accuracy of marking out to create a prototype and how to minimise waste • Surface treatments and finishes – Appropriate treatments for different materials and uses. **<u>Designing for others – Practical project</u>** • Research in to design brief • Mood board and primary / secondary research • Initial design ideas and sketches • Prototype modelling – Understanding how to use card and foam to present ideas • Development and presentation of idea • Analysis of idea against specification • Use of CAD / CAM to further develop idea	**<u>Energy, Materials, Systems and Devices – Practical elements fed throughout *</u>** • Energy generation – Non renewable - Fossil and nuclear fuels. Renewable sources; wind, solar, tidal, hydroelectric and biomass. • Energy storage – Batteries and their uses. • Modern materials – How they can change to alter their function / Linked to smart materials • Smart materials – Hydro / Thermo / Electro • Composite materials (Further development of KS3 knowledge. • Systems – Electronic systems. Flowcharts and block diagrams to help solve a problem. • Electronics - How development of components have changed products and their uses ***<u>Mechanical devices</u>** • Understand how mechanisms can be used to change magnitude and direction of force, including levers, linkages and rotary systems – Cardboard practical project. Students to develop different mechanisms and linkages which link together to develop a moving part / project	

Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	• How materials and their properties are applied within design technology and everyday products
	• Use of tools and equipment:
	  ○ Try square
	  ○ Steel ruler (Measuring in mm)
		• How to apply different techniques of drawing. Sketching / Crating / Oblique / Isometric and orthographic
		• What is a CAD and 3D design?
			• How new and emerging technologies have an impact on the world around us
			• Understand the importance of sustainability and the environment
			• How products are developed and enterprise
				• How to write a design brief using key terminology from a given brief set by the exam board
				• How to analyse products using ACCESSFM with key terminology linked back from previous units

	○ Tenon saw ○ Pillar drill ○ Band facer ○ Coping saw ○ Chisel • Use of CAD / CAM and specialist equipment: ○ Laser cutter ○ Vacuum former ○ Line bending • Health and safety concepts • How forces work on materials • The impact technology plays on the environment and how to calculate carbon footprints • How different scales of production impact products	• How to create complex shapes and rendering to look like realistic materials • How to write a specification linked to a design brief • How to analyse the work of existing designers and design movements – how they apply to design development • How tolerance and materials selection are applied • Understand different modelling techniques and how to apply them when creating individual design ideas	• How to write a design specification • Understanding what sustainability is and how it links to everyday products • Understanding the 6R's and how to develop products to meet the requirements • How to build a client profile and meet clients needs • How mechanical systems are integrated within products and how devices operate • Understanding how electronics impact design and the function of components • How to write a systems diagram for how products work	• Understanding how to develop initial ideas using research and analysis • How to apply prototyping and modelling techniques using initial design sketches and ideas
Examples of Reading Opportunity	• Revision guide • Internet research • PowerPoints • Worksheets • Step by step guides	• Revision guide • Internet research • PowerPoints • Worksheets • Step by step guides	• Revision guide • Internet research • PowerPoints • Worksheets • Step by step guides	• Revision guide • Internet research • PowerPoints • Worksheets • Step by step guides
Examples of Key Tier 2 Vocabulary	• Sources • Origins • Properties • Physical • Working • Equipment • Force • Stress • Ecological • Impact	• Design • Drawing • Sketching • Curved • Complex • Oblique • Vertical • Horizontal • Isometric • CAD • Rendering • Shading	• Sources • Energy • Environment • Power • Turbine • Technology • Reduce • Reuse • Recycle • Repair • Rethink • Refuse • Industry • Evaluation • Movement • Motion	• Analysis • Brief • Design • Products • Customer • Function • Modelling • Research

Examples of Key Tier 3 Vocabulary	• Assembling • Specification • Development • Tolerance • Sustainability • Environmental • Application • Reinforcement • Strengthen • Functionality • Workability • Continuous	• Orthographic • Specification • Development • Iterative • Prototyping • Developmental • Application • Modelling • Techniques • Individual • Realism	• Enterprise • Sustainability • Generation • Environmental • Impact • Schematic • Renewable • Finite • Infinite • Development • Emerging • Functionality • Technology Push • Market Pull • Mechanical systems • Mechanisms	• Specification • Aesthetics • Terminology • Prototyping • Analysing

Year 11

Unit Title	*NEA – 50% of course waiting*	*Exam Theory 50%*

Composite Knowledge/End Point (big idea that should be answered at the end of a unit)	The iterative design process from start to finish and have applied a variety of different techniques and research to design, develop, make and evaluate a working prototype based on an exam board specification
	• 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.
		Student will further develop knowledge from KS3 and the understanding of the key theory elements as delivered in the GCSE specification.
		Core technical principles
		• new and emerging technologies
		• energy generation and storage
		• developments in new materials
		• systems approach to designing
		• mechanical devices
		• materials and their working properties.
		Specialist Technical Principles
		• selection of materials or components
		• forces and stresses
		• ecological and social footprint
		• sources and origins
		• using and working with materials
		• stock forms, types and sizes
		• scales of production
		• specialist techniques and processes
		• surface treatments and finishes.
		Designing and making principle
		• investigation, primary and secondary data
		• environmental, social and economic challenge
		• the work of others
		• design strategies
		• communication of design ideas
		• prototype development
		• selection of materials and components
		• tolerances
		• material management
		• specialist tools and equipment
		• specialist techniques and processes

Examples of Key Substantive Knowledge (specific subject knowledge relied upon for later study or to grasp the composite idea for that unit)	**NEA – Independent Project** Students have started NEA at the end of Y10 when the initial brief was released. They are to work on and produce the following using a PowerPoint document also with physical models and drawings / sketches. Substantial design and make task Assessment criteria: • Identifying and investigating design possibilities • Producing a design brief and specification • Generating design ideas • Developing design ideas • Realising design ideas • Analysing & evaluating • Photographic evidence of the final manufactured prototype.	**Exam Theory** *Students will be taught a range of theory content. Some theory content will be recall and some will be new. Students will have a range of exam questions to complete based on the theory they have learned.* • Understanding the exam • Exam language • Layout of questions and the paper Core and technical principles linked to the exam knowledge the students will need. Each of the elements below can be expanded further to more detail of what can be included. • New and emerging technologies • Energy generation and storage • Developments in new materials • Systems approach to designing • Mechanical devices • Materials and their working properties.
Examples of Key Disciplinary Knowledge (methods/framework to establish knowledge)	• How to develop initial design ideas based on a given design brief • How to effectively use CAD and CAM to utilise and expand ideas further • Working safely with a range of different tools and materials • Working with a client and developing questionnaire to suit user needs • How to write a design brief and design specification • How to develop design ideas and model to create working prototypes for further development • How to evaluate ideas and follow an iterative design process to fulfil the design brief and client potential • How to prioritise tasks and work alongside others to develop and realise ideas	Understanding the importance of theory content across the different key areas from the GCSE specification Core technical principles Specialist technical principles Design and making principles
Examples of Reading Opportunity	• Revision guide • Internet research • PowerPoints • Worksheets • Step by step guides • Primary and secondary research sources	• Revision guide • Internet research • PowerPoints • Worksheets
Examples of Key Tier 2 Vocabulary	• Sources • Origins • Properties • Physical • Working • Equipment	• Sources • Energy • Environment • Power • Turbine • Technology

	• Force • Stress • Ecological • Impact • Design • Drawing • Sketching • Curved • Complex • Oblique • Vertical • Horizontal • Isometric • CAD • Rendering • Shading	• Reduce • Reuse • Recycle • Repair • Rethink • Refuse • Industry • Evaluation • Movement • Motion • Analysis • Brief • Design • Products • Customer • Function • Modelling • Research
Examples of Key Tier 3 Vocabulary	• Assembling • Specification • Development • Tolerance • Sustainability • Environmental • Application • Reinforcement • Strengthen • Functionality • Workability • Continuous • Orthographic • Specification • Development • Iterative • Prototyping • Developmental • Application • Modelling	• Enterprise • Sustainability • Generation • Environmental • Impact • Schematic • Renewable • Finite • Infinite • Development • Emerging • Functionality • Technology Push • Market Pull • Mechanical systems • Mechanisms • Specification • Aesthetics • Terminology • Prototyping

	• Techniques • Individual • Realism	• Analysing