GCSE Product Design

Curriculum Overview

Key Stage – KS4

Joy Progress Success Act with care, kindness, respect and integrity

Our curriculum is carefully sequenced to ensure cumulative knowledge and progression. Each unit builds on the last, with clear concepts that students must grasp to progress. We define end points to illustrate what mastery looks like by year-end.

Location of resources:	**https://drive.google.com/drive/folders/1DVqCMleM9yF0vXeJstifNmUPmviKHexA?usp=drive_link**
Curriculum intent and rationale:	***The engineering & technology curriculum develops students who are not just a generation of hobbyists but are work ready members of society who possess a comprehensive knowledge, understanding and skills set to resiliently tackle everyday design problems.*** ***They are able to create innovative and high-quality solutions that strive to make life better in an increasingly technological world.*** Students are taught in mixed ability groups, with a total of 3 lessons per week. Students follow the OCR GCSE Design & Technology specification: GCSE - Design and Technology (9-1) - J310 The **rationale for teaching OCR GCSE Design & Technology** lies in its ability to equip students with the creative, technical, and problem-solving skills essential for modern life and work. The course encourages learners to think critically, design innovatively, and respond to real-world challenges with sustainable and user-focused solutions. It builds confidence through hands-on learning, fosters resilience through iterative design, and promotes independence through project-based assessment. By linking theory to practice and nurturing transferable skills such as communication, collaboration, and analysis, OCR GCSE D&T prepares students for further study, apprenticeships, and careers in a wide range of design, engineering, and technology sectors.
National Curriculum Links:	**N/A at KS4**

What content needs to be covered? Key Knowledge and skills / misconceptions to address (with vocab in bold and spelling underlined)
By the end of the year students will know:

Yr 10 Half Term 1	Yr 10 Half Term 2	Yr 10 Half Term 3	Yr 10 Half Term 4	Yr 10 Half Term 5	Yr 10 Half Term 6
Students will learn key knowledge and skills about: **Metals (module)** *What are the main categories of materials available to designers when developing design solutions? ferrous and non-ferrous metals, including:* i. ferrous metals, e.g. iron, mild steel and stainless steel ii. non-ferrous metals, e.g. aluminium, copper and tin iii. alloys, e.g. brass, pewter and tin/lead solder. *Why is it important to understand the sources or origins of materials and/or system components?* The sources and origins of specific materials and/or system components. An overview of the processes used to extract and/or convert the source material into a workable form.	**Students will learn key knowledge and skills about:** **Metals (module) – continued** *What are the impacts of new and emerging technologies when developing design solutions?* *Exploration of the impacts within different contexts on:* i. industry and enterprise, such as the circular economy ii. people, in relation to lifestyle, culture and society iii. the environment iv. sustainability. *How do designers choose appropriate sources of energy to make products and power systems?* *The generation of electricity and how energy is stored and transferred. The appropriate use in products and systems of renewable and non-renewable sources*	**Students will learn key knowledge and skills about:** **Wood (module)** *What are the main categories of materials available to designers when developing design solutions? natural and manufactured timber, including:* i. hardwoods, e.g. oak, birch and teak ii. softwood, e.g. pine, cedar and spruce iii. manufactured boards, e.g. MDF, plywood and block board. *How can materials and products be finished for different purposes? The processes used for finishing and adding surface treatments to materials and products for specific purposes, including:* i. function, such as: durability and added resistance to overcome environmental factors ii. aesthetics.	**Students will learn key knowledge and skills about:** **Mechanisms (module)** *How do we introduce controlled movement to products and systems? An overview of different sorts of movement and types of motion, including:* i. rotary ii. linear iii. oscillating iv. reciprocating. *The effect of forces on the ease of movement, including:* i. load ii. effort iii. fulcrum. *How different mechanical devices are used to change the magnitude and direction of motion or forces, including consideration of:* i. cams ii. gears	**Students will learn key knowledge and skills about:** **Technical Challenge (module)** *What gives a product structural integrity? How and why specific materials and/or system components need to be reinforced or stiffened to withstand forces and stresses. Awareness of the processes that can be used to ensure the structural integrity of a product, such as:* • triangulation • plastic webbing • reinforcing. *How do electronic systems provide functionality to products and processes? How sensors and control devices respond to a variety of inputs, including:* i. sensors including light dependent resistors (LDR), infra-red sensors ii. switches including tilt switches, push-to-make switches and time-delay switches.	**Students will learn key knowledge and skills about:** **Start of NEA Iterative Design Challenge - AO1 Explore** Students will learn how to undertake an investigation into a set Context through the following • Producing a detailed Mind map to explore the context in depth, and highlighting a number of potential problems • Investigating Opportunities through online research to justify the highlighted problems (statistics, articles, etc), and to recognise and discuss the potential opportunities, narrowing down the list Students will learn how to analyse and justify reasoned arguments in the development of a Design Brief, through the following

Consideration of the ecological, social and ethical issues associated with processing specific materials and/or system components to convert them into workable forms, such as:
• mining, harvesting, manufacturing, transporting.
The lifecycle of specific materials and/or system components when used in products.
Consideration of recycling, reuse and disposal of specific materials and/or system components, such as:
• recycling and sustainability schemes
• eco-materials
• upcycling.

Why is it important to know the different available forms of specific materials and/or systems components?
Awareness of commonly available forms and standard units of measurement of specific materials and/or system components when calculating costs and quantities, including:
i. weights and sizes
ii. stock forms, such as:
o lengths, sheets, pellets, reels, rolls, rods.
iii. standard components, such as:
o paper and boards, e.g. clips, fasteners, bindings
o timber, e.g. hinges, brackets, screws
o metals, e.g. bolts, rivets, hinges
o polymers, e.g. caps, fasteners, bolts
o fibres and fabrics, e.g. zips, buttons, poppers
o system components, e.g. resistors, capacitors, diodes, transistors and drivers, microcontrollers
o mechanical components, e.g. gears and cams, pulleys and belts, levers and linkages.

How do designers and manufacturers ensure accuracy when making prototypes and products? The use of appropriate and accurate marking out methods, including:
i. measuring and use of reference points, lines and surfaces
ii. templates, jigs and/or patterns
iii. working within tolerances

including:
i. fossil fuels, nuclear fuel, bio-fuel
ii. wind, hydro-electricity, tidal and solar.

How do new and emerging technologies have an impact on production techniques and systems? Critical evaluation of the benefits and implications of incorporating new and emerging technologies into production processes, such as:
• consideration of economies of scale
• how disruptive technologies such as 3D printing and robotics are changing manufacturing.

Dyson (module) – continued

What factors are important to consider when selecting appropriate materials and/or system components when designing? The characteristic properties of the main categories of materials (not the specific materials) and why this makes them appropriate for different uses, such as:
• density, strength, hardness, durability, strength to weight ratio, stiffness, elasticity, impact resistance, plasticity, corrosive resistance to chemicals and weather, flammability, absorbency, thermal and electrical conductivity.
The physical and working properties of specific materials and/or system components, with consideration of:
i. how easy they are to work with
ii. how well they fulfil the required functions of products in different contexts.
Other factors that influence the selection of materials and/or components, including;
i. required functionality of the design solution
ii. aesthetic attributes
iii. environmental considerations
iv. availability and cost of stock forms
v. social, cultural and ethical considerations

Spinner (module)

What are the main categories of materials available to designers when developing design solutions?
i. thermo polymers, e.g. PET, HDPE, PVC, LDPE, PS, PP, ABS, acrylic and TPE
ii. thermosetting polymers, e.g. silicone; epoxy resin and polyester resin.

How can materials be manipulated and joined in different ways in a workshop environment when making final prototypes? The use of specialist techniques, hand tools and equipment used to shape, fabricate, construct and assemble high quality prototypes, with exemplification of the following processes:
i. wastage, such as:
o paper and boards, e.g. cutting and punching
o timber, e.g. sawing, drilling and turning
o metals, e.g. sawing, drilling, sheering and turning
o polymers, e.g. sawing and drilling
ii. addition, such as:
o timber, e.g. adhesion, joining and laminating
o metals, e.g. adhesion, welding/braising and riveting
o polymers, e.g. adhesion and heat welding.
iii. deforming and reforming, such as:
o timber, e.g. steaming and pressing
o metals, e.g. pressing, bending and casting
o polymers, e.g. moulding, vacuum forming and line bending

Graphics (module)

How can design solutions be communicated to demonstrate their suitability to a third party?
The use of graphical techniques to communicate ideas, modifications, constructional and technical considerations, such as:
- clear 2D and 3D sketches with notes
- sketch modelling
- exploded drawings
- mathematical modelling
- flow charts.

Students will recap, retrieve and build on key knowledge and skills from half term 2:

- The characteristic properties of the main categories of materials (not the specific materials) and why this makes them appropriate for different uses
- The use of 2D and 3D digital technology and tools are used to present,
- model, design and manufacture solutions

iii. pulleys and belts
iv. levers and linkages.

How do processes vary when manufacturing products to different scales of production? The methods used for manufacturing at different scales of production,
including:
i. one-off, bespoke production
ii. batch production
iii. mass production
iv. lean manufacturing and just-in-time (JIT) methods.
Awareness of manufacturing processes used for larger scales of production, such as:
• timber, e.g. CNC routers, sawing and steam bending machines and lathes
• metals, e.g. CNC milling, turning, sheet metal folding, pressing and stampings, and die casting
• polymers, e.g. compression moulding, injection moulding, vacuum forming, rotational moulding, extrusion and blow moulding
• design engineering, e.g. laser cutting, rapid prototyping and 3D printing.

Graphics (module) – continued

How can materials and processes be used to make iterative models? The processes and techniques used to produce early models and/or toiles to support iterative designing.

Students will recap, retrieve and build on key knowledge and skills from half term 3:

- The main categories of materials available to designers when developing design solutions - natural and manufactured timber
- The processes used for finishing and adding surface treatments to materials and products for specific purposes
- The use of specialist techniques, hand tools and equipment used to shape, fabricate, construct and assemble high quality prototypes
- The use of graphical techniques to communicate ideas, modifications, constructional and technical considerations

Challenge: To attain the highest mark band level across each distinct module

How devices are used to produce a range of outputs, including:
i. light-emitting diodes (LED) to produce light
ii. speakers and buzzers to produce sound
iii. motors to produce motion.
The use of programmable components such as microcontrollers, to embed functionality into products in order to enhance and customise their operation.

Design Challenge (module)

How do designers source information and thinking when problem solving? Awareness of different design approaches, including:
i. user-centred design
ii. systems thinking.
The importance of collaboration to gain specialist knowledge from across subject areas when delivering solutions in design and manufacturing industries.

How can cost and availability of specific materials and/or system components affect their selection when designing?
The significance of the cost of specific materials and/or system components in relation to commercial viability, different stakeholder needs and marketability.
How to calculate the quantities, cost and sizes of materials and/or system components required in a design or product, being able to apply this to different applications.

Students will recap, retrieve and build on key knowledge and skills from half term 4:

- An overview of different sorts of movement and types of motion
- How different mechanical devices are used to change the magnitude and direction of motion or forces
- The processes and techniques used to produce early models and/or toiles to support iterative designing

Challenge: To attain the highest mark band level across each distinct module

Misconceptions:
- Triangles are the strongest shapes (only from the side)
- Microcontrollers are the same as computers, just smaller
- Only one person designs a whole product

- Generating a list of briefs from the reduced list of problems
- Justifying the selection of the most viable Brief by considering access to appropriate PUR & stakeholders, and priority of need for a solution (the best opportunity)
- Concluding the investigation with a Design Brief, a concise statement covering what problem is being solved, who are the stakeholders and PUR, and what environment it will be used in

Students will learn suitable methods for investigating the requirements of a product, through the following
- Recognising a range of stakeholders, surveying a recognised target market, and listing their needs & wants
- Interviewing a PUR, presenting first hand research of their situation, and listing their needs & wants
- Producing a concise list of Requirements (a non-technical specification) for the solution, and recognising the key requirements that will need to be referred to during the design development

Students will recap, retrieve and build on key knowledge and skills from half term 1:
- Considerations for exploring a context
- Considerations in relation to user interaction with design solutions
- Exploration and critique of existing designs, systems and products to
- identify features and methods
- Consideration of environmental, social and economic influences

Challenge: To attain the highest mark band level for AO1 Explore

Misconceptions:
- Investigations should be focussed on a problem, not a product
- Internet research is not hugely helpful, primary research is key
- Survey questions like name, age, favourite colour etc does not provide helpful research – questions

iv. understanding efficient cutting and how to minimise waste. **Dyson (module)** *How can exploring the context a design solution is intended for inform decisions and outcomes?* *Considerations for exploring a context should include:* i. where and how the product or system is used ii. identifying primary user and wider stakeholder requirements iii. how the investigation of social, cultural, moral and economic factors to identify opportunities and constraints can influence the design process. *Why is usability an important consideration when designing prototypes?* *Considerations in relation to user interaction with design solutions, including:* i. the impact of a solution on a user's lifestyle ii. the ease of use and inclusivity of design solutions iii. ergonomic considerations and anthropometric data to support ease of use iv. aesthetic considerations. *What are the opportunities and constraints that influence design and making requirements?* *Exploration and critique of existing designs, systems and products to identify features and methods, considerations should include:* i. the materials, components and processes that have been used ii. the influence of fashion, trends, taste and/or style iii. the influence of marketing and branding iv. the impact on society v. the impact on usability vi. the impact on the environment; lifecycle assessment vii. the work of past and present professionals and companies in the area of Design and Technology.	iii. modern and smart materials such as graphene, super alloys, biopolymers and nano-materials iv. composite materials and their purpose in relation to contrasting applications *How do industry professionals use digital design tools when exploring and developing design ideas? The use of 2D and 3D digital technology and tools are used to present, model, design and manufacture solutions, such as:* • rapid prototyping • image creation and manipulation software • digital manufacture • interpretation of plans, elevations of 3D models • CAD, CAM, CAE. **Students will recap, retrieve and build on key knowledge and skills from half term 1:** • The main categories of materials available to designers when developing design solutions - ferrous and non-ferrous metals • The different available forms of specific materials and components • The use of appropriate and accurate marking out methods • Exploration and critique of existing designs, systems and products to • identify features and methods • Consideration of environmental, social and economic influences **Challenge:** To attain the highest mark band level across each distinct module **Misconceptions:** • Modern automation in manufacture is taking away people's jobs • CAM CAM is easy and cheap • What the term 'strong' means • Materials are chosen purely for their mechanical properties	**Challenge:** To attain the highest mark band level across each distinct module **Misconceptions:** • All hardwoods are 'hard', all softwoods are 'soft' • Surface finishing is just for appearance • Woods can't be bent • All plastics melt • Design ideas all have to be 3D	**Misconceptions:** • Mechanisms are just about changing movement • Gears are only on bikes and cars • Mass production is cheap • Mass produced products are all made by machine	• Material choice is purely about cost	need to be focussed on what you need to help you design a successful product

How do developments in Design and Technology influence design decisions and practice? *Critical evaluation of how new and emerging technologies influence and inform design decisions, considering both contemporary and potential future scenarios from the perspectives, such as:* • ethics • the environment • product enhancement. *What wider implications can have an influence on the processes of designing and making?* *Consideration of environmental, social and economic influences, including:* i. environmental initiatives ii. fair trade iii. social and ethical awareness iv. global sustainable development. **Challenge:** To attain the highest mark band level across each distinct module **Misconceptions:** • That all metals are magnetic • That ergonomic means comfortable to sit on • Designing a product only involves what it looks like and what it does • Being environmentally friendly just means to use recycled materials					
Yr 11 Half Term 1	**Yr 11 Half Term 2**	**Yr 11 Half Term 3**	**Yr 11 Half Term 4**	**Yr 11 Half Term 5**	
Students will learn key knowledge and skills about: ***NEA Iterative Design Challenge - AO1 Explore (continued)*** Students will learn how to investigate existing products, using first hand (product disassembly where possible) and second-hand product analysis, highlighting how they address the requirements, and which elements might be incorporated into their own solution ***NEA Iterative Design Challenge – AO2 Design***	**Students will learn key knowledge and skills about:** ***NEA Iterative Design Challenge – AO2 Design (continued)*** Students will learn how to select the most promising design by evaluating against the key requirements, collating stakeholder and PUR feedback, and highlighting key issues that need to be developed. Students will build on their skills in the development of a design solution, using testing and evaluation, referencing key requirements, using feedback to highlight problems and justify each modification,	**Students will learn key knowledge and skills about:** ***NEA Iterative Design Challenge – AO2 Create*** Students will learn how to plan the manufacture of a product, through the production of a Gantt chart with timings, expanded to include full details for each stage including materials, tools, equipment, processes, QC and H&S. Students will develop their practical skills in their application to manufacturing their planned prototype product. This will be evidenced on the maintaining of a	**Students will learn key knowledge and skills about:** ***NEA Iterative Design Challenge – AO3 Evaluate*** Students will learn how to justify the viability of a product, through the following • comparing their finished prototype to their technical specification and explaining their reasoning for any changes • comparing their prototype to an existing competitive product to discuss and justify its marketability Students will learn how to fully test their prototype with PUR feedback, including	*Exam Preparation (J310-01)* Revisiting key theory topics: **Core Technical Principles (All students must study these)** - New and emerging technologies - Energy generation and storage - Modern and smart materials - Systems approach to designing - Mechanical devices - Materials and their working properties	

GCSE Product Design

Curriculum Overview

Key Stage – KS4

JOHN PORT SPENCER ACADEMY

Joy Progress Success Act with care, kindness, respect and integrity

Our curriculum is carefully sequenced to ensure cumulative knowledge and progression. Each unit builds on the last, with clear

Students will build on existing skills in the development of initial design ideas, completing the following • Producing a brainstorm of product ideas in partnership with their selected PUR, putting together a mood-board to inspire creative thinking, generating collaborative design work with peers, and incorporating blue-sky thinking to build innovation and originality • Presenting a range of ideas with detailed sketching and annotation, keeping focus on the key requirements previously stated • Producing a range of quick paper / card models, with further development of the more viable ideas **Theory – recap** Design considerations Material considerations **Students will recap, retrieve and build on key knowledge and skills from Y10:** • The characteristic properties of the main categories of materials (not the specific materials) and why this makes them appropriate for different uses • The use of graphical techniques to communicate ideas, modifications, constructional and technical considerations **Challenge:** To attain the highest mark band level for AO2 Design Independence when completing this section of the NEA **Misconceptions:** • Design ideas can only be generated yourself – the starting point can involve ideas from others (peers, PUR, stakeholders) • Designs have to be perfectly presented and shaded – usually the initial ideas are quick and scribbled, the important thing is to communicate an idea	and investigate additional research where needed (which will include measurements, anthropometric and other technical data, material investigations and recognition of products and concepts to inspire innovation in their work). Students will evidence their growing understanding of materials, tools, equipment and processes (include H&S) using annotations, photos/videos, and CAD work with screenshots, in the production of the following • Annotated sketches to quickly illustrate new ideas and changes • Solid modelling with hand tools to develop form and function • CAD modelling to trial concepts • 3D printing to develop accuracy and fitments ***NEA Iterative Design Challenge – AO2 Design (continued)*** Students will learn how to present a final design through the production of quality rendered isometric drawings and zoomed in views, showing full details of the features of their proposal. Students will build on existing experience in learning how to present a technical specification, which include engineering drawings (part and assembly) with a parts list covering the materials required and manufacturing processes that would be used in industrial production. **Theory – recap** Technical understanding Manufacturing processes and techniques **Students will recap, retrieve and build on key knowledge and skills from Y10:** • The use of 2D and 3D digital technology and tools are used to present, • model, design and manufacture solutions • The use of graphical techniques to communicate ideas, modifications, constructional and technical considerations • The processes and techniques used to produce early models and/or toiles to support iterative designing	manufacture diary, which demonstrates their understanding of each material, tool, equipment and process used through annotated photographic and video evidence. Students will learn how to best present a range of photos and videos to show the quality and details of their finished prototype, and learn how to apply branding to develop it further into a marketable product **Students will recap, retrieve and build on key knowledge and skills from Y10:** • The use of specialist techniques, hand tools and equipment used to shape, fabricate, construct and assemble high quality prototypes • The use of appropriate and accurate marking out • The processes used for finishing and adding surface treatments to materials and products for specific purposes **Challenge:** To attain the highest mark band level for AO2 Create Independence when completing this section of the NEA **Misconceptions:** • Making a good quality product will get the top marks – evidence must be collected and presented in order to gain marks from the practical work • Manufacture of products can be worked out along the way – planning is crucial for a successful product • Making something always goes to plan – problems always occur, this is expected and you won't lose marks for changing your plan	collecting photographic and video evidence, in the analysis and discussion of fitness for purpose. This will include collating stakeholder reviews and feedback where possible to conclude the feasibility of their idea. Students will learn how to critically compare their prototype against the recognised requirements, to highlight the strengths and weaknesses, and suggest improvements. Students will learn how to collate their findings in the presentation of modifications and design optimisation, highlighting improvements (sketches/CAD/physical models) plus further changes to make their prototype suitable for commercial production, incorporating understanding of manufacturing processes, and suitable materials. **Students will recap, retrieve and build on key knowledge and skills from Y10:** • Considerations in relation to user interaction with design solutions • The significance of the cost of specific materials and/or system components in relation to commercial viability, different stakeholder needs and marketability • The methods used for manufacturing at different scales of production **Challenge:** To attain the highest mark band level for AO3 Evaluate Independence when completing this section of the NEA **Misconceptions:** • Evaluating is just about looking at the strengths and weaknesses – this is one small part of evaluation, testing, feedback, and development are equally important • Testing means just using the product – testing also requires collecting feedback from others which might be visual as much as physical (which may not be possible with a non-functioning prototype)	**Specialist Technical Principles (Based on chosen material area)** Students focus on one material category (e.g., woods, metals, polymers, textiles, papers and boards), and revise: - Selection of materials and components - Forces and stresses - Ecological and social footprint - Scales of production - Sources and origins - Stock forms, types and sizes - Surface treatments and finishes **Designing and Making Principles** - Investigation and analysis of data - The work of others (designers and companies) - Design strategies and communication - Prototype development - Tools, equipment, and processes - Accuracy and quality control Practice papers and mock exams: • Use OCR sample assessments and mark schemes • Focus on command words and exam technique • Targeted revision sessions: • Based on mock exam feedback • Use flashcards, quizzes, and group work *Topics tailored to individual class / student needs – **adaptive teaching*** *Personal learning checklists used to identify areas of weakness* **Students will recap, retrieve and build on key knowledge and skills:** This term will focus on the theory in preparation for the examined assessment (J310-01) This will focus on recalling the skills and knowledge that they have been	

• Designs are drawn on paper – quick paper models are a great way to develop design thinking and communicate to others	**Challenge:** To attain the highest mark band level for AO2 Design Independence when completing this section of the NEA **Misconceptions:** • Models have to be physical – 3D CAD modelling is a viable option to develop design thinking and present to stakeholders • Models have to be finished and painted – often the physical form or specific features are all that are important for a specific model • What you think is all that matters – designing for stakeholders means it is their view that has to be taken into consideration, not your own preference			taught across the whole course, applying knowledge to various exam style questions. **Challenge:** Challenge will focus around analysis of the command words and generation of answers that satisfy the marks available to each question – focus on gaining full marks for each answer. Analysis of past papers, to allow trends to be spotted. Generation of own exam style questions **Misconceptions:** Vary depending on the group and mock QLA analysis	

Previous learning that is particularly relevant:

Design Process and Problem Solving Understanding and applying the iterative design process Responding to design briefs and user needs Generating, developing, and communicating ideas through sketches, models, and digital tools **Materials and Their Properties** Exploring a range of materials: woods, metals, plastics and composites Understanding basic material properties and appropriate uses Making informed decisions about material selection	**Making and Practical Skills** Safe and accurate use of tools, equipment, and machinery Measuring, marking out, cutting, joining, and finishing techniques Producing functional prototypes and evaluating outcomes **Technical Knowledge** Introduction to mechanical systems and electronics Understanding motion in products Knowledge of CAD/CAM and digital manufacturing	**Sustainability and Ethical Design** Awareness of environmental impact Considering social, moral, and cultural factors in design **Evaluation and Reflection** Testing and evaluating products against design criteria Using feedback to improve designs and processes

Future Learning - How content prepares students for future units, Key Stage 4, or Key Stage 5?

The OCR GCSE Design & Technology (J310) course is purposefully structured to provide a strong foundation for progression to Key Stage 5 (KS5) qualifications, such as A-level Design and Technology or vocational pathways in engineering, product design, or creative industries.	**It prepares students for KS5 by:** 1. **Development of Core Knowledge** • Covers **technical principles** across materials, systems, and manufacturing processes. • Introduces **sustainability, ergonomics, and user-centered design**, which are expanded upon at KS5. • Encourages understanding of **historical and contemporary design influences**, laying the groundwork for critical analysis at A-level. 2. **Practical and Iterative Design Skills** • Students engage in **hands-on prototyping**, using tools, machinery, and CAD/CAM software. • The **iterative design process** mirrors the approach used in KS5 coursework, fostering familiarity with: • Research and investigation • Idea generation and development • Testing and evaluation	3. **Independent Project Work (NEA)** • The Non-Exam Assessment (NEA) requires students to respond to a contextual challenge, mirroring the design portfolio work expected at KS5. • Builds project management, time planning, and documentation skills essential for A-level coursework. **4. Analytical and Critical Thinking** • Students learn to evaluate existing products, materials, and design decisions. • Encourages justification of design choices, a key skill in KS5 written and practical assessments. **5. Communication and Presentation** • Emphasis on visual communication through sketching, modelling, and CAD. • Students practice annotating designs, writing specifications, and presenting ideas—skills that are vital for KS5 and beyond. **6. Career and Further Study Awareness** • Introduces students to **design careers**, industry practices, and real-world applications.

- Encourages exploration of **STEM and creative pathways**, helping students make informed choices at KS5.

Outcomes:
By the end of the year pupils will be able to solve/create/produce/write:

- Solve real-world problems by applying design thinking, creativity, and technical knowledge.
- Create innovative and functional products using a range of materials, tools, and digital technologies.
- Produce detailed design documentation, including sketches, models, prototypes, and evaluations.
- Write clear and structured design briefs, specifications, and reflective evaluations that demonstrate understanding of user needs, sustainability, and technical principles.

Assessment Strategy How we know our students are knowing and remembering more –
Data from hunting not fishing, formative and summative assessment/s is used to adapt teaching and provide targeted challenge and intervention, supporting SEND and disadvantaged pupils.

Formative:

- Monitor ongoing progress: We assess students' understanding of design principles, materials, and processes through classwork, discussions, and practical tasks.
- Provide feedback: Regular, constructive feedback helps students refine their ideas, improve technical skills, and develop their design thinking.
- Support NEA preparation: Formative assessment guides students through the iterative design process, helping them document research, develop prototypes, and evaluate outcomes.
- Encourage reflection: Students are encouraged to self-assess and peer-assess, promoting critical thinking and ownership of learning.
- Tracking Progress Against Assessment Objectives: We use checklists and observation records to monitor how well students are meeting the criteria. This helps inform teaching and ensures students are on track for success.

Others include:

- Verbal feedback during lessons
- Written comments on digital portfolios
- Checklists and rubrics aligned with assessment objectives
- Peer and self-assessment activities
- 1:1 progress reviews to set targets and next steps
- Marking of mock examinations & use of mock feedback lessons

Summative (& cumulative)

This includes two main components:
Written Exam – Principles of Design and Technology (J310/01)
Worth 50% of the final grade
Assesses students' knowledge of core technical principles, designing and making principles, and specialist technical principles
Includes multiple-choice, short-answer, and extended-response questions
Non-Exam Assessment (NEA) – Iterative Design Challenge (J310/02/03)
Also worth 50%
Students identify a design problem, research, generate ideas, develop prototypes, and evaluate their outcomes
Assessed on creativity, technical skills, and the iterative design process
Internally assessed and externally moderated

Cumulative
The NEA is a culmination of skills developed throughout the course.
The exam tests understanding built progressively across KS3 and KS4.
We often use mock exams, project milestones, and portfolio reviews to track cumulative learning and readiness for final assessments.

Opportunities to revisit past learning:

Iterative Design Process
The NEA (Non-Exam Assessment) encourages students to revisit earlier stages of their project—such as research, idea generation, and development—based on testing and feedback.
This cyclical approach reinforces learning and promotes reflection and improvement.
Theory Embedded in Practice
Core and specialist technical principles taught in theory lessons are reapplied during practical tasks and NEA work.
For example, knowledge of materials, manufacturing processes, and sustainability is revisited when students make design decisions.
Learning from Existing Products
Students explore and critique existing designs and the work of past and present professionals.
This helps them revisit and apply design principles in new contexts, reinforcing analytical and evaluative skills.
Mock Exams and Retrieval Practice
We use mock exams, quizzes, and low-stakes testing to revisit key content from earlier in the course.
These activities support memory retention and exam readiness.
Cross-Topic Connections
Topics such as ergonomics, user needs, and environmental impact are revisited across different units and tasks, helping students make connections and deepen understanding.
Feedback and Reflection
Regular formative feedback encourages students to reflect on their progress and revisit earlier work to improve it—especially in the NEA.
Subject specific Revision Programme
Produced for December onwards (Yr 11), it gives pupils a week-by-week guide on which topics to cover / re-cap and when. This is supported by page links to the revision guide and links to exam style questions.

Opportunities for homework (including apps):
Completion of set assignments linked to the NEA
Seneca tests

How is the curriculum adapted to meet the needs of SEND and disadvantaged pupils, while maintaining high expectations?

- Practical applications make learning more meaningful and accessible
- Repetition and retrieval practice from formative and summative assessments
- DT Contribution paid for Pupil Premium – support materials used in school
- PP and SEND students take priority seating within our classrooms
- Scaffolding e.g. modelling, showing exemplar work
- Teaching Materials – clear font, coloured backgrounds, videos / step-by-step images projected on the board to show key processes
- Written Feedback for identified assessments
- Dedicated time in lessons to address misconceptions
- We maintain ambitious goals for SEND and disadvantaged pupils
- Variety of teaching styles used to support individual needs
- Access to SEND information e.g. passports
- We use formative assessment to identify barriers and adapt teaching in real time
- Feedback is specific, actionable, and encouraging, helping pupils understand how to improve
- Purchasing of revision guides for Pupil Premium students

Wider Curriculum and Enrichment – cultural capital and real world application -

Enriching experiences:

The subject immerses students in real-world, creative problem-solving. Through hands-on projects, students explore materials, tools, and digital technologies like CAD/CAM, developing both technical and imaginative skills. The course encourages independent thinking, resilience, and innovation through the iterative design process. Students gain ownership of their learning by choosing their own NEA contexts, making learning personal and meaningful.
These experiences not only deepen subject knowledge but also build confidence, curiosity, and a strong foundation for future study or careers in design and technology.

Our curriculum supports the school value of:

Joy	*Foster enthusiasm and engagement by offering hands-on, creative learning that connects to real-world challenges. Students enjoy designing for purpose, using modern tools like CAD/CAM, exploring sustainability, and taking ownership of projects—making learning meaningful, empowering, and personally relevant.*
Progress	*We monitor and support progress through a combination of formative and summative assessment strategies. Teachers track student progress through regular **practical tasks, design reviews, and written assessments** aligned with the assessment objectives (AO1–AO3). Feedback is provided through **peer critiques, teacher marking, and one-to-one discussions**, helping students reflect and improve. Progress in the **Non-Exam Assessment (NEA)** is monitored through milestone check-ins and portfolio reviews. Differentiated support, including scaffolding, modelling, and targeted intervention, ensures all learners can succeed. Digital tools like*

Literacy, Oracy and disciplinary language:

Literacy: Reading and Writing in Context

- **Extended writing tasks** in the NEA and written exam require students to:
  - Justify design decisions
  - Evaluate materials and processes
  - Reflect on user needs and sustainability
- Students engage with **technical texts**, specifications, and design briefs, building comprehension of complex information.
- Encourages use of **subject-specific vocabulary** in written responses, such as “ergonomics,” “tensile strength,” “iterative design,” and “anthropometrics.”

Oracy: Speaking and Listening for Design Thinking

- Classroom activities promote **collaborative discussion**, including:
  - Peer critiques of design ideas
  - Group problem-solving and brainstorming
  - Presenting design concepts to an audience
- Students practice **verbal reasoning**, defending their choices and responding to feedback—skills transferable to interviews, presentations, and KS5 study.

Disciplinary Language: Mastering the Language of Design

- The course embeds **disciplinary literacy** by teaching students to:
- Use precise terminology when describing materials, tools, and processes
- Interpret and produce **technical drawings, annotations, and specifications**

Cross-Curricular opportunities / Opportunities to develop ‘character’:

Mathematics
- Students apply **mathematical skills** in:
  - Measuring and marking out materials
  - Calculating tolerances, forces, and loads
  - Interpreting data from user surveys and product testing
- Supports numeracy through **scale drawings, ratios, percentages, and geometry**.

Science
- Reinforces **physics and materials science**:
- Properties and behaviors of materials (e.g., conductivity, elasticity, hardness)
- Forces, motion, and energy in mechanical systems
- Environmental science through sustainability and life-cycle analysis

Art & Design
- Encourages **creativity and visual communication**:
- Sketching, rendering, and CAD modelling
- Exploring aesthetics, form, and function
- Understanding design movements and cultural influences

English
- Develops **literacy and communication**:
- Writing design briefs, specifications, and evaluations
- Using subject-specific vocabulary and persuasive language
- Presenting and justifying design ideas verbally and in writing

Business Studies & Economics
- Links to **entrepreneurship and product development**:
- Understanding market research, user needs, and branding
- Considering cost, pricing, and commercial viability
- Exploring intellectual property and ethical production

Computing & ICT
- Integrates **digital skills**:
- Using CAD/CAM software and 3D modelling tools
- Understanding programmable systems and electronics
- Applying data analysis and digital presentation tools

	CAD software and online portfolios also help track development and showcase learning over time.
Success	*We celebrate success by giving verbal praise, positive phone calls, reward points and showcasing exceptional performance – such as practical work, NEA content or written pieces.*
Act with care, kindness, respect, and integrity	*We build meaningful connections with our students by creating a supportive, inclusive, and inspiring learning environment. Teachers can foster strong relationships by showing genuine interest in students' ideas, offering personalised feedback, and encouraging creativity and risk-taking. Giving students ownership of their projects—especially in the NEA—helps them feel valued and motivated. Regular one-to-one discussions, celebrating individual progress, and linking learning to real-world contexts also deepen engagement. By listening actively, respecting diverse perspectives, and nurturing a collaborative classroom culture, teachers help students feel confident, connected, and empowered to succeed in both design and life.*

- Understand and apply **command words** in exam questions (e.g., "analyse," "evaluate," "justify")

Practical Application of Language

- Through the **NEA project**, students produce a **design portfolio** that combines visual and written communication.
- Encourages **multimodal literacy**—integrating sketches, CAD models, annotations, and written analysis.

Textiles, Food, and Engineering

- Offers **specialist pathways** that align with:
- Fashion and textiles (fibres, fabrics, garment design)
- Engineering (mechanisms, electronics, structural design)
- Food technology (packaging, ergonomics, sustainability)

This course nurtures character by encouraging resilience, creativity, and responsibility. Students tackle real-world problems through iterative design, learning to persevere and adapt. Independent project work fosters self-motivation and time management, while collaboration builds empathy and teamwork. Ethical considerations—like sustainability and inclusivity—promote integrity and social awareness. Learners reflect on their decisions, justify choices, and communicate ideas clearly, developing confidence and critical thinking. By engaging with diverse challenges and user needs, students grow into thoughtful, responsible individuals prepared for further study, employment, and active citizenship. Character development is embedded in every stage of the design journey.

Our curriculum supports personal development by:

1.Independent Thinking and Problem Solving

- Encourages students to identify real-world problems and develop creative, user-centered solutions.
- Promotes resilience and adaptability through iterative design—learning from failure and refining ideas.

2. Collaboration and Communication

- Group tasks and peer feedback sessions build teamwork, listening, and negotiation skills.
- Students learn to present and justify their ideas, developing confidence in verbal and visual communication.

3. Responsibility and Self-Management

- The Non-Exam Assessment (NEA) requires students to manage a long-term project, fostering:
- Time management
- Organisational skills
- Accountability for their own learning

4. Ethical and Environmental Awareness

- Explores the social, moral, and environmental impact of design decisions.
- Encourages students to consider sustainability, inclusivity, and ethical production, shaping them into responsible global citizens.

5. Career Awareness and Aspirations

- Introduces students to design and engineering careers, helping them make informed choices about future pathways.
- Builds confidence and ambition through exposure to real-world design contexts and industry practices.

6. Creativity and Self-Expression

- Provides a platform for students to express their identity, values, and interests through design.
- Celebrates diverse perspectives and cultural influences, promoting inclusivity and empathy.

Careers / Employability skills:
How does the curriculum link to the following employability skills:

Listening –
Encourages students to engage with user feedback, collaborate in teams, respond to peer critique, and adapt designs based on verbal input—mirroring real-world professional communication.

Speaking –
Encourages students to present ideas, justify design decisions, engage in peer critiques, and communicate with clarity—developing confidence and professionalism essential for workplace collaboration and client interaction.

Problem solving –
Challenges students to identify real-world needs, generate creative solutions, test prototypes, and evaluate outcomes—mirroring the iterative thinking and adaptability required in modern, solution-focused workplaces

Aiming high –
Encourages students to set ambitious goals, take ownership of long-term projects, reflect on progress, and strive for excellence in both creative and technical aspects of their work

Critical thinking –
Challenges students to analyse problems, evaluate materials and processes, and justify design decisions. Through iterative design and reflective practice, students build the analytical mindset essential for innovation and workplace decision-making

Staying positive –
Encourages students to persist through design challenges, learn from setbacks, and embrace feedback—building resilience, optimism, and a growth mindset essential for success in the workplace

Leadership –
Encourages students to take initiative in project work, guide peer collaboration, make informed decisions, and confidently present and justify their ideas—mirroring leadership roles in real-world design and industry settings

Teamwork –
Encourages students to collaborate on design tasks, share feedback, solve problems collectively, and respect diverse perspectives—mirroring the cooperative, communicative environments found in modern workplaces

Creativity –
Encourages students to generate original ideas, experiment with materials and processes, and solve real-world problems through innovative thinking—mirroring the creative demands of modern design, engineering, and manufacturing industries.

Employment Sectors discussed include:

- Engineering – including mechanical, civil, electrical, and structural engineering roles.
- Product Design – designing consumer goods, industrial equipment, and innovative technologies.
- Architecture and Construction – involving design, planning, and sustainable building practices.

		• Fashion and Textiles – careers in garment design, textile innovation, and sustainable fashion. • Manufacturing and Advanced Production – including prototyping, quality control, and smart manufacturing. • Digital Design and CAD – roles involving 3D modelling, computer-aided design, and digital fabrication. • Automotive and Aerospace – designing and developing vehicles, systems, and components. • Medical Technology – creating assistive devices, prosthetics, and healthcare innovations. • Sustainability and Green Technology – working on eco-design, renewable energy products, and sustainable materials. • Creative Industries – including set design, product styling, and multimedia design.

Curriculum impact is evaluated through pupil study, work scrutiny, and progress data. Findings inform regular curriculum review to ensure continuous improvement.

When was this curriculum last reviewed? Include date	What changes were made and why?	How is ongoing improvement ensured?
July 25		Work scrutiny, QA monitoring, Learning Walks, CPD sessions
		Faculty meetings, examination reports, recall of exam scripts
		NEA and Mock moderation