Curriculum Intent
Design and Technology Year 10 and Year 11

PRIORITIES IN WHOLE SCHOOL CURRICULUM INTENT

- Enjoyment of learning
- Knowledge acquisition and recall
- Extensive vocabulary
- Effective communication through writing, speaking & listening, and use of technology
- Numeracy
- Critical evaluation of information
- Enterprise and problem-solving
- Working with others

SUBJECT CURRICULUM INTENT

The 3D Design curriculum aims to inspire and equip students with the creative, technical, and practical skills needed to thrive in the ever-evolving fields of design and industry. This subject builds a strong foundation for students to enter design-related professions, leveraging advanced tools such as 3D printers, laser cutters, and CAD software to keep pace with modern industry practices. By integrating traditional design skills with cutting-edge technologies like virtual modelling and CNC machinery, the curriculum enables students to explore the full spectrum of the design process—from concept to production.

Students will have the opportunity to engage with real-world design challenges, learning about contemporary manufacturing techniques and innovations in technology. They will also develop a critical eye, making informed value judgments about the aesthetic, economic, social, moral, and technical aspects of design, both in their own work and when evaluating the creations of others. This holistic approach not only prepares students for careers in design but also nurtures their ability to think critically and creatively in a fast-paced, technologically-driven world.

KEY QUESTIONS TO CONSIDER

1. Why has content been selected? Content has been selected based on foundational principles of 3D design, such as form, space, texture, and materiality. These core concepts are critical because they provide students with the ability to create and interpret complex structures. The course also emphasises industry-standard software and techniques, ensuring that students acquire the practical skills required for professional application in fields like architecture, and product design. The inclusion of both technical and creative components ensures a comprehensive understanding of the discipline.

2. Does learning provide sufficient challenge? The course offers progressive challenges, starting with introductory projects that build confidence in basic 3D design tools and concepts. As students advance, they encounter increasingly complex design tasks that require critical thinking, creativity, and technical proficiency. Projects are differentiated to ensure that all students, regardless of prior experience, are continuously pushed to expand their abilities. More advanced learners are given opportunities to engage in independent research.

3. Why is learning sequenced in this way? The course is sequenced to first establish a solid foundation in design principles and technical skills, with each subsequent unit building on this knowledge. Early lessons focus on fundamental concepts such as geometry, structure, and basic rendering, while later units incorporate advanced modeling, animation, and prototyping techniques. This scaffolding approach ensures that students can progressively tackle more sophisticated design problems, culminating in comprehensive projects that integrate multiple skill sets and concepts learned throughout the course. Increasing breadth and depth over time.

4. How is learning sequenced or spaced to promote long-term memory? Key concepts and skills are revisited throughout the course in different contexts to reinforce learning. Spaced repetition is employed by reintroducing critical design principles and techniques at regular intervals, often through practical applications in varied project work.

This approach helps students retain and refine their skills over time. Additionally, opportunities for reflective practice such as peer critiques, self-assessments, and portfolio development support long-term retention by encouraging students to evaluate their learning progress and apply feedback to future designs.

HOW IS THE EXTENDED TIME IN KS4 USED TO IMPROVE & ENRICH LEARNING IN THE SUBJECT?

In 3D Design, the extended time in KS4 is used strategically to deepen and enhance students' understanding of both the creative and technical aspects of the subject. During Year 10, students focus on building a strong foundation in 3D design principles, software proficiency, and critical thinking, which prepares them for the Non-Exam Assessment (NEA) in Year 11, accounting for 40% of the GCSE. This time is used to strengthen skills in areas like modelling, rendering, and prototyping, ensuring students are well-equipped for both the portfolio and the NEA.

To enrich their learning experience, students are introduced to the broader context of 3D design in today's industrial and technological landscape.

	YEAR 10				
	KNOWLEDGE	**CONCEPTS**	**SKILLS**	**RATIONALE**	**FUTURE DEVELOPMENT**
Term 1	Students will develop appropriate techniques used to communicate design ideas through 3D sketches, models, and visuals. They will learn; Material categories and their key names and properties. Sketching techniques to represent 3D ideas effectively. 3D Modelling using both digital and physical mediums. Modelling with card and other flexible materials to create prototypes. Iterative design process to refine and develop concepts. Selecting and using specialist 3D techniques and processes. Emphasising accuracy in construction and design. Surface treatments and finishes to enhance the aesthetic and functionality of 3D designs. Quality control methods to ensure precision in 3D projects. Sustainability and environmental considerations in materials and production processes. **(Pewter Casting)** Understanding material categories and their properties relevant to casting. Identifying key materials used in casting and their applications. Evaluating the sustainability of materials and processes. Critical evaluation of new and emerging technologies, including planned obsolescence. Designing products with maintenance, durability, and environmental impact in mind. **(Vacuum Forming Mould and Outcome)** Using appropriate techniques to communicate design ideas in 3D form. Understanding material categories and their properties relevant to vacuum forming. Exploring production in industry, focusing on vacuum forming processes. Understanding production techniques, systems, and the role of automation.	The concept of this project is to guide students through a comprehensive design process where they work on a design brief and develop the necessary knowledge and skills to bring their ideas to life. The project emphasises the importance of understanding materials, using specialist techniques, and considering environmental impacts, all while fostering independent design through practical and theoretical learning. Students are presented with a design brief that outlines specific criteria and goals for their project. This task challenges them to develop solutions while considering functionality, aesthetics, and sustainability. As they progress, they engage in independent decision-making and problem-solving to realise their creative intent, ensuring their final design meets the outlined objectives. **Students develop knowledge about materials** • **Woods**: Students are introduced to different categories of wood, including **hardwoods**, **softwoods**, and **manufactured boards**. They learn where each type is commonly used and why, focusing on the unique properties of each. • **Metals**: Students dive deeper into metals, breaking them down into **ferrous** and **non-ferrous** categories. In the development phase, students expand their skills in **Computer-Aided Design (CAD)** software. They use this technology to create detailed, accurate models of their designs, allowing them to experiment with ideas and visualise the final product. CAD software helps students develop independence in their design process by enabling them to create precise digital models and simulations before moving into the physical creation stage. Students gain hands-on experience with specialist techniques that are crucial for working with different materials: • **Woodwork**: Learning how to cut specific angles using the	Students develop a diverse array of skills essential for their growth in design, technology, and practical problem-solving. Here's a breakdown of the key skills they learn: **Sketching and Drawing Skills** Students enhance their drawing skills through the use of 3D design software, such as Google SketchUp. This software allows them to create detailed and accurate digital representations of their design ideas. Learning to sketch in 3D helps students visualize their concepts more effectively and communicate their ideas to others. **Virtual Modelling Skills** Through virtual modelling, students gain proficiency in creating digital prototypes of their designs. This skill not only helps in visualizing and refining ideas but also facilitates experimentation with different design elements without the need for physical materials initially. It fosters creativity and innovation as students can iterate quickly. **Quality Control** Students learn the importance of quality control by implementing controlled steps to ensure that each product meets high standards at every stage of the production process. They develop an eye for detail, assessing their work continuously to identify areas for improvement and ensuring that the final product is polished and functional. **Mathematical Skills** Fundamental mathematical skills such as addition, subtraction, multiplication, and division are reinforced throughout the project. Students apply these skills in practical contexts, such as calculating dimensions, angles, and material requirements, ensuring accuracy in their designs and construction processes. **Practical Skills Development** As students engage in hands-on activities, they develop practical skills in working with materials like metal and wood. They learn to analyse their findings, draw conclusions, and make independent decisions during the iterative design process. This ability to reflect critically on their work enhances their problem-solving skills and prepares them for real-world challenges. **Prototyping** Students gain experience in shaping, fabricating, and constructing high-quality prototypes using various	The rationale behind this project is rooted in several key educational principles and goals that aim to equip students with a comprehensive skill set for the modern design and technology landscape. **Real-World Application** The project emphasises practical skills and knowledge that students can apply in real-world contexts. By engaging with materials, tools, and techniques commonly used in industry, students gain relevant experience that prepares them for future careers in design, engineering, and technology. **Interdisciplinary Learning** Integrating various subjects—such as mathematics, art, science, and technology—encourages students to make connections between different fields. This holistic approach enhances critical thinking and problem-solving skills, allowing students to tackle complex challenges from multiple perspectives. **Hands-On Experience** The project prioritises hands-on learning, enabling students to actively engage with materials and processes. This experiential approach fosters creativity, innovation, and confidence as students experiment with different techniques, make decisions, and learn from trial and error. **Development of Technical Skills** By focusing on both traditional craftsmanship and modern digital design techniques (like CAD), the project ensures that students develop a robust technical skill set. This combination prepares them for diverse career paths and equips them to navigate an increasingly technology-driven world. **Encouragement of Iterative Design** The iterative design process encourages students to continuously refine and improve their ideas based on feedback and reflection. This practice not only enhances their final products but also instills a growth mindset, teaching students that design is a dynamic and evolving process. **Emphasis on Sustainability** By incorporating lessons on environmental impact, material sourcing, and sustainable practices, the project fosters an awareness of the importance of sustainability in design and manufacturing. This focus prepares students to make responsible choices in their future careers, contributing	Future development in this project context involves several pathways to enhance student learning, adapt to evolving industry standards, and integrate new technologies. Here are some key areas for future development: As technology continues to evolve, future projects could incorporate more advanced tools and techniques, such as: • **3D Printing**: Providing students with opportunities to design and print prototypes, allowing for rapid iteration and experimentation with complex geometries. • **Virtual Reality (VR) and Augmented Reality (AR)**: Utilizing VR and AR for immersive design experiences, enabling students to visualize their projects in a virtual space and conduct simulations. Future developments could further emphasise sustainability by: Researching Eco-Friendly Materials: Incorporating studies on biodegradable, recycled, or sustainably sourced materials to promote responsible design practices.

	Evaluating the ethical considerations of production and its impact on the environment. Sustainability and environmental considerations in energy usage and production. Critical evaluation of planned obsolescence and emerging technologies. Designing for maintenance, sustainability, and ethical considerations. Gathering and analysing primary and secondary data for design projects. Developing a design brief and manufacturing specification. Studying the work of others to inform and inspire design decisions.	appropriate saws and tools, helping them understand the precision required in woodcraft. **The 6 R's**: Students develop an understanding of sustainability through the **6 R's—Reduce, Reuse, Recycle, Repair, Rethink, Refuse—** and why these principles are essential in the design and making process. They reflect on how their material choices and production methods can impact the environment and how to minimise waste and resource consumption. **Production Miles**: The concept of **production miles** is introduced, helping students understand how the transportation of materials and products contributes to environmental degradation. They explore ways to reduce the carbon footprint of their designs by considering local sourcing and efficient production methods. Students explore how **new and emerging technologies** influence design and manufacturing, learning about advancements in materials, processes, and production techniques. They discuss how technology can drive innovation in products and how it impacts both the industry and the environment. Understanding different manufacturing processes is key to developing a well-rounded design approach. Students learn about: **Mass production**, where large quantities of products are made using assembly lines. **Batch production**, where limited quantities are produced in specific runs. **Just-in-time (JIT)** production, which minimizes waste and reduces storage by producing only what is needed, when it is needed. These insights help students design with manufacturing in mind, ensuring their products are efficient and sustainable.	materials. They learn the techniques necessary for building functional models, understanding the importance of craftsmanship and precision in their work. **Surface Treatments and Finishes** Preparation and application of surface treatments and finishes are key skills developed in both metal and wood projects. Students learn about different finishing techniques that enhance the durability, appearance, and functionality of their products, understanding how these treatments affect the overall quality of the final piece. **Practical Equipment Skills** Using design and technology equipment effectively is a crucial part of the learning process. Students learn how to plan and investigate projects, write methods for their work, photograph results, and evaluate their outcomes. This holistic approach ensures that they can document their processes and findings thoroughly. **Mathematical Calculations** Students learn to perform calculations related to angles and degrees, further enhancing their mathematical understanding in practical applications. This knowledge is crucial when working with tools and machinery, as precision is key to successful design and construction. **CAD Design Work** Students use 2D design tools to create CAD (Computer-Aided Design) models, which familiarizes them with industry-standard practices. This skill is essential for modern design and engineering fields, allowing students to create detailed and accurate plans for their projects. **Understanding New and Emerging Technologies** Students explore new and emerging technologies, gaining insights into how these advancements impact design and manufacturing. They examine case studies, such as the Jaguar Land Rover factory, to understand the role of technology in modern production environments. **Group Discussions on Automation and Robotics** In group discussions, students evaluate the benefits and disadvantages of fully automated manufacturing systems and the use of robotics. This collaborative approach encourages critical thinking and fosters communication skills as they share perspectives and analyse the implications of automation in industry. **Production Methods in Industry**	positively to society and the environment. **Collaboration and Communication** Group discussions and collaborative projects cultivate essential soft skills, such as teamwork, communication, and negotiation. These interpersonal skills are vital in any workplace and help students learn to work effectively with others to achieve common goals. **Critical Evaluation and Reflection** Encouraging students to evaluate their work and the work of others fosters critical thinking and self-assessment. By reflecting on their processes and outcomes, students develop the ability to identify strengths and weaknesses, which is crucial for personal and professional growth. **Exposure to New Technologies** Introducing students to new and emerging technologies keeps them informed about current trends in the industry. This exposure not only enhances their technical knowledge but also encourages adaptability and a willingness to embrace innovation in their future endeavors.	

			Students learn key terms and concepts related to various production methods, including: **Computer Aided Design (CAD)**: Enhances design accuracy and efficiency. **Computer Aided Manufacture (CAM)**: Integrates design and manufacturing processes. **Flexible Manufacturing Systems (FMS)**: Adapts to changes in product type or volume. **Just in Time (JIT)**: Reduces inventory costs by synchronizing production with demand. **Lean Manufacturing**: Focuses on minimising waste while maximising productivity. By examining these production techniques, students gain a deeper understanding of how they can be applied in different contexts within the manufacturing sector. **Business and Product Success** The project also covers different methods of creating a successful business and product development strategies. Students discuss the importance of market research, customer needs, and effective marketing strategies in making a product successful.		
Year 11	In Year 11, students focus on several key areas of knowledge and skills as they prepare for their exams and Students develop the ability to create a comprehensive design brief that outlines the project goals, target audience, and constraints. They also learn to write detailed manufacturing specifications that include materials, processes, and quality criteria. They will learn about the impact of design decisions on the environment, society, and economy is emphasised. Students learn to identify challenges and consider sustainable practices in their design processes, fostering a sense of responsibility in their work. Students practice brainstorming and sketching initial design ideas. They learn techniques for generating creative concepts and the importance of considering user needs and functionality from the outset. Through cardboard modelling, students develop their prototyping skills. They create physical representations of their ideas, which helps them visualise scale, form, and functionality. This hands-on experience encourages	Students engage with various concepts that not only enhance their understanding of the design process but also directly inform how they create their work. Here's how these concepts are linked to the practical aspects of 3D design: Primary Data: Students collect primary data relevant to their design projects through surveys and interviews. This hands-on approach helps them understand user needs, which they incorporate into their 3D designs. They analyse existing information from various sources to inform their material choices and design features, ensuring their work is based on solid research. Students learn to write a clear design brief that outlines their project goals, target audience, and constraints. This brief serves as a foundation for their 3D design work, guiding their creative decisions throughout the process. The manufacturing specification details how their 3D designs will be produced. Students write their own specifications, including material requirements, dimensions, and manufacturing methods, which are essential for	Year 11 student undertake research using their understanding of Social, Economic and environmental Factors. They learn how to be able to create a detailed explanation of work of others using these to inform their design. They develop their understanding of materials. They learn how to develop annotation used to justify all design decisions. They need to Demonstrate specific techniques used to communicate in 2D or 3D (isometric, perspective) Draw out a technical drawing/ plan drawing. Students produce design solutions prototype more guided approach taken with this outcome as it is the first model. Techniques explored and practiced to encourage students to work on making sketches and models. Make further modifications to design ideas and begin to produce 3D models of these on Google sketch up. Models could be scaled for higher ability students. Students begin to measure and mark out parts of their toys in their chosen material.	The rationale behind the Year 11 3D design curriculum is rooted in preparing students to become informed, skilled, and responsible designers. This approach emphasizes the integration of theoretical knowledge with practical application, fostering a holistic understanding of the design process. Below is an outline of the key components of the rationale: 1. Real-World Relevance The curriculum connects design concepts to real-world applications, ensuring students understand the relevance of their work. By examining client and user needs, they learn to create designs that are functional and responsive to the market. 2. Interdisciplinary Learning Students engage with various disciplines, including mathematics and science. This interdisciplinary approach reinforces the importance of critical thinking and problem-solving, essential skills for any designer. 3. Sustainability and Ethics Emphasising environmental, social, and economic factors encourages students to consider the broader implications of their designs. Understanding the impact of materials, processes, and production methods instills a sense of responsibility towards sustainability and ethical practices in design.	The future development of the Year 11 3D design curriculum aims to continuously enhance student learning experiences, adapt to emerging technologies, and align with industry trends. Here are some key areas for potential growth.

	iterative thinking as they refine their designs. Students focus on developing their initial ideas into more detailed designs. They learn to evaluate their concepts critically and make necessary adjustments based on feedback and testing. They select appropriate materials and processes to use in their work such as Using CAD software, students create final 3D models of their designs. They learn to utilise advanced features of the software to produce precise, professional-quality designs that can be easily shared and modified. Students gain knowledge about selecting appropriate materials for their prototypes based on properties and availability. They also learn to determine stock sizes and how to optimise material use to minimise waste. Understanding where to source materials is essential. Students explore local suppliers, online resources, and sustainable options, reinforcing the importance of responsible sourcing in their projects. Students study the principles of forces and stresses that affect their designs and how this impacts their design. Conducting tests on prototypes is a critical step in the design process. Students learn various testing methods to evaluate the performance and safety of their products, gathering data to inform further development. Precision is key in manufacturing. Students develop skills in measuring and marking out materials accurately, which is vital for ensuring that their prototypes meet design specifications. As they manufacture their prototypes, students maintain a manufacture diary to document the processes, challenges, and decisions made throughout production. This reflection aids in understanding the iterative nature of design. Students explore commercial manufacturing processes, including batch and mass production methods. They also learn about various surface finishes, understanding how these affect the product's aesthetics and functionality. Finally, students learn to analyse and evaluate their prototypes critically. They reflect on what worked well, what could be improved, and how their designs meet the	transforming their ideas into tangible products. Students explore the environmental consequences of various materials and manufacturing processes. They examine how mining, drilling, and farming impact ecosystems, which informs their choices in sustainable materials for their 3D designs. Understanding deforestation and pollution helps them consider the lifecycle of their products. They learn about how design decisions can contribute to global warming and pollution. This knowledge encourages them to select eco-friendly materials and processes in their 3D projects, fostering a commitment to sustainability. The curriculum addresses social responsibility and fair trade practices. Students reflect on how their design and manufacturing choices affect communities, promoting ethical considerations in their 3D design processes. Through research packs on materials like hardwoods, softwoods, and manufactured boards, students develop a solid understanding of material properties. This knowledge is directly applied when selecting materials for their 3D projects, influencing their design and construction choices. Students gain practical skills in using various tools and techniques for 3D design. They learn to operate machinery and use software effectively, enabling them to create precise and innovative designs. They explore different methods of idea development, such as sketching and prototyping. By creating physical models, students can visualize their designs in three dimensions, allowing for iterative improvements and better communication of their ideas. Students practice specific techniques like isometric and perspective drawing to represent their designs accurately. These skills help them convey their ideas effectively in both 2D sketches and 3D models, enhancing their overall design communication.	Developing ideas through prototyping and modelling. Model part or the entire object to scale (maths links – working to and working out the scale). Students work independently to begin shaping parts of their prototypes Manufacture diaries could be used to plan out each activity and use of tools and equipment. Demonstration of treatments and finishes used on a range of materials. Samples carried out to test a range of treatments. Students recall and apply knowledge as appropriate	4. Skill Development The curriculum is designed to cultivate a diverse skill set, including technical proficiency, creativity, and analytical thinking. By engaging in hands-on projects, students gain practical experience that enhances their confidence and ability to work independently. 5. Iterative Design Process Encouraging an iterative design process allows students to experiment, test, and refine their ideas. This approach fosters resilience and adaptability, teaching them that failure can be a valuable part of the learning journey. 6. Communication and Collaboration Students learn to communicate their ideas effectively through sketching, technical drawing, and digital modelling. Collaboration and feedback are emphasized, preparing them for real-world scenarios where teamwork is crucial. 7. Preparation for Future Endeavours The curriculum aims to prepare students for further education and careers in design and technology. By developing a comprehensive portfolio of work, students showcase their abilities and thought processes, providing a foundation for future studies or employment. 8. Personal Growth and Reflection Students are encouraged to reflect on their design journey through maintenance of manufacture diaries and self-assessment. This reflective practice helps them identify strengths, areas for improvement, and personal growth throughout the course.	

	original brief. This evaluation is essential for making informed decisions in future projects.				
YEAR 11 ENRICHED LEARNING EXPERIENCES Strive					