Subject	Design and Technology	Year Group: 9	9
	Half of Carousel rotation - Approx 6-7 weeks	**Half of Carousel rotation - Approx 6-7 weeks**	
Scheme title	**D&T Materials - Using metals and timbers to make a pewter cast and decorative box**	**CAD/CAM and additive manufacturing (3D printing)**	
Purpose of scheme	For this scheme pupils will learn about using metal as a material and learn about its raw form and how it can be processed through a range of manufacturing methods. Pupils will learn some of the more generic information about metals, including raw form, the difference between ferrous and non ferrous metal and whate defines and alloy. The purpose of this is to introduce pupils to one of the main resistant materials, ,which satisfies the requirements of the national curriculum and also underpins the material knowledge required at GCSE for the core techincal principles.	This Year 9 scheme of work focuses on advancing pupils' digital literacy through CAD/CAM and additive manufacturing—the process of creating objects by layering material, such as 3D printing. Students will master 3D modeling using Tinkercad and Onshape, progressing from basic shapes to complex parametric design. By exploring why additive manufacturing is a cornerstone of modern industry—allowing for rapid prototyping and reduced material waste—pupils will apply their skills to design and 3D print a functional outcome, bridging the gap between virtual concepts and physical reality.	
Knowledge in sequence	Pupils will begin by learning about biomimicry and how this will be the source of inspiration for the client brief. Pupils will learn how pewter casting is done in the classroom and will quicklly begin to make mould used CAD/ CAM and further develop[ing their understanding of using the laser cutter. Pupils will learn about what pewter is and what type of metal category it comes under. Pupils will learn about the raw form for metal and how it is extracted. They will also be able to explain the difference between ferrous and non ferrous metals and why some metals are alloyed.	Pupils begin by defining additive manufacturing and exploring its transformative role in global industry, specifically for rapid prototyping and complex geometries. They will establish the critical link between Computer-Aided Design (CAD) software and the hardware of 3D printing. Pupil develop digital modeling skills across two platforms: starting with the primitive-based logic of Tinkercad and progressing to the professional, parametric constraints of Onshape. These skills are then applied to design a bespoke, functional product.Once the digital model is complete, pupils learn the vital "slicing" stage. This involves converting 3D geometry into G-code layers, where they must consider print orientation, infill density, and the placement of sacrificial support structures.The sequence moves to the physical print phase, where pupils operate the machinery to produce their outcome. Post-processing involves the careful removal of supports and surface finishing, followed by rigorous testing and evaluation against their original design criteria.	
Skills	This project his heavily focussed on skills as pupils will not only manufacture a pewter keyring, but they will also construct a small wooden box using complex wood joints. Pupils will further develop their skills using hand tools to carve out the finger joints on thier box as well as machines needed to smooth and shape the box to achieve a high quality finish. The pewter cast also requires cutting, shaping and smoothing to achieve maximum shine. The tools include Tri squares, tenon saws, coping saws, files and smoothing paper for metal and timber. Pupils will also use the laser cutter and band facer. For moulding the metal, pupils will learn what the correct PPE is for moulding metal as this is a high risk practical activity. Pupils will learn how to melt pewter using a blow torch safely and how to handle the metled pewter in a very hot state. For the pewter cast pupils will also develop their skills on the laser cutter by learn how to source images from the internet to both trace and vectorise, helping them to become more independent using our CAD/CAM facilities.	Through this advanced CAD/CAM unit, pupils will master complex digital geometry by learning to manipulate 2D sketches into 3D forms using the extruding tool to add depth and the revolving tool to create symmetrical, turned parts around an axis. They will further enhance their modeling sophistication by utilising the lofting feature, which allows them to transition smoothly between different cross-sectional shapes to create organic or aerodynamic designs. Beyond these specific drawing techniques, Pupils will acquire the technical skill of slicing, where they translate their digital files into machine-ready code by adjusting infill and layer heights. This process teaches them to anticipate mechanical stresses and material behavior, ultimately developing the precision engineering and computational thinking skills required to navigate the entire design-to-manufacture workflow.	
Key words	Pewter, Casting, Mould, Laser cutter, 2D design, Gauntlets, Ladle, Hacksaw Junior Hacksaw, Pillar drill, Wet and dry, CAD/CAM	Additive manufacturing, CAD, CAM, Tinkercad, Onshape, extruding, revolving, lofting, slicing, G-code, filament, 3D printing, rapid prototyping, infill, supports, tolerance, evaluation.	

End point	By the end of this project, pupils will be able to use the laser cutter more independently and have a further understanding of it's potential when manufacturing. Pupils will know where metal comes from and which stock forms it can be purchased in. Pupils will know how to mould pewter and this will become and additional manufacturing method they can take into GCSE. They will know what a finger joint is and how to construct one and their skills with the hand tools will become so much more accurate. The level of practical required for this project and the quality of the finished product will hopefully help pupils develop a positive perspctive of D&T as a subject and consider taking it as a GCSE subject.	By the end of this project, pupils will have gained a comprehensive understanding of the modern design-to-manufacture workflow, moving from initial concept to a physical 3D-printed reality. Through mastering sophisticated software like Onshape, pupils develop the ability to visualise and manipulate complex geometries, enhancing their spatial reasoning and technical literacy. By engaging with additive manufacturing, they learn to solve real-world engineering challenges, such as managing material waste and refining prototypes. Ultimately, pupils achieve the confidence to independently use industry-standard technology to realise their own creative and functional designs.
Assessment Methods	Key assessment pieces includes **design, manufacturing**, literacy (Usually in the form or **evaluation** or analysis) and **technical** assessment (Socrative online assessment assessing theoretical understanding of the chosen materials and its processes.)	Key assessment pieces includes **design, manufacturing**, literacy (Usually in the form or **evaluation** or analysis) and **technical** assessment (Socrative online assessment assessing theoretical understanding of the chosen materials and its processes.)