

**Subject: Design Technology**

Year group: 8

**Project intent: Develop a basic understanding about Aluminium and Steel and various processes used to cut, join and shape/form these metals.**

This project aims to cover the broad range of information students need to understand metals; including, where they come from, how they are processed, what they are used for (based on their properties) and importantly, their impact on the Earth. As well as this, students will develop how to use common tools and processes that focus around these metals and how we can manipulate, shape, form, cut and join them in different ways.

This Unit will cover topics that are not only fundamental to progression in the Design and Technology curriculum but also the Engineering Level 1/2 course. Additionally, this Unit will aim to link with subjects such as Maths and Science in order to build on students' prior knowledge with the aim of reinforcing specific topics, such as area/ volume (maths) and electronic theory (science). This will help students develop academic links and appreciate the wider STEM agenda.

This Unit covers a range of criteria from the 'Making' part of the Design Technology Curriculum map as well as some of the more academic criteria from the 'Technical' part. Students will develop an understanding about the following processes; Brazing, drilling, bending (using the metal bender), stamping and finishing techniques for metal. These processes cover aspects of the 'making' criteria and allow students to build on their understanding of metal properties as well as prepare them for exam questions in KS4.

Unit 1 – Metals theory and processes		Unit 1 – Metals 'exam' knowledge	
<b>Making</b> Generating, developing, modelling and communicating ideas	M1 - You are able to select appropriately from specialist tools i.e. scribe	<b>Technical Knowledge (big picture/fundamental topics)</b> Making products work	T1 - Types of materials e.g wood, metal, plastic and textiles
	M2 - You are able to select appropriately from specialist techniques and processes		T2 - Material properties
	M3 - You understand different materials based on their properties, such as malleability		T3 - Joining methods
	M4 - You can explain and follow safety rules and procedures		T4 - Safety and risk assessment
	M5 - You demonstrate the ability to use complex materials i.e. plywood		T10 - Circuits and electronic components
	M6 - You have demonstrated use of a broad range of processes and techniques		T11 - Maths - measuring and dimensioning
	M8 - You have demonstrated applying a range of finishing techniques i.e.		T12 - Maths - Area and volume
	M9 - You have demonstrated the ability to mark out accurately on different materials		
	M10 - You have demonstrated use of different joining techniques		
	M11 - You have demonstrated modifying the appearance of materials		

Week beginning	Subject Topic	Key Learning points/big questions	Tier 3 vocabulary	Independent/Home learning	Linked Assessment (DT NC mapping criteria)	Resources	Unit assessment booklet
<b>Week 1</b>	<p>Introduction to Engineering and rotation expectations</p> <p>Start aluminium keyring – measuring and marking out accurately <b>*Teacher demo*</b></p> <p>Explanation on materials especially properties of aluminium. Issue blanks and begin marking out. Use of templates.</p>	<p><b>Intentions:</b></p> <ul style="list-style-type: none"> <li>- Understand how metals are extracted as ore and turned in to aluminium and steel</li> <li>- Become familiar with mining and its impacts on the environment.</li> </ul> <p><b>Questions:</b> *follow questions in powerpoint*</p> <p>What colour was the Statue of Liberty originally and why has it changed? Name products normally made from copper From science lessons, can you tell me what an ore is? From where in the earth would they be extracted from? Other than the energy used, name some other negative impacts that might arise from mining? What benefits could mining bring to a region? What may happen to an open pit at the end of its useful life? DP: What may be the knock-on effects of the pollution caused by this industry?</p> <p>Understand the difference between ferrous and non-ferrous metals Understand the parallels between engineering and maths How to measure and mark out accurately Start marking out aluminium key ring</p>	<p>Ferrous Non-ferrous Toughness Malleability Hardness Orthographic Tolerance Accuracy Scriber Try square Steel rule Marking blue</p>	<p>Brain dump task</p> <p><b>BRAIN DUMP</b></p>  <p>Students to write in their books, in mind map form, everything they remember from the topic covered during lesson/researched from KO.</p>	<p>M3 - You understand different materials based on their properties, such as malleability M6 - You have demonstrated use of a broad range of processes and techniques M9 - You have demonstrated the ability to mark out accurately on different materials T1 - Types of materials e.g wood, metal, plastic and textiles T2 - Material properties</p>		
					Retrieval practice		
<b>Week 2</b>	<p>Continue Aluminium keyring - Stamping and drilling <b>*Teacher demo*</b></p> <p>Steel letter holder – Measuring and marking out <b>*Teacher demo*</b></p> <p>Explanation on materials especially properties of mild steel. Issue blanks and begin marking out. Use of templates.</p>	<p><b>Intentions</b></p> <ul style="list-style-type: none"> <li>- Complete work on keyring</li> <li>- How to use a pillar drill safely (risk assessment)</li> <li>- Start to measure, mark and cut the pieces for the coat hook</li> </ul> <p><b>Questions:</b></p> <p>Recap tools used for marking out during previous lesson What is meant by accuracy? What is a tolerance and why are they important If we work to a 1mm tolerance and something has to be 50mm in length, what are the acceptable upper and lower limits that we can work to? What safety precautions should we take when using a pillar drill? What does PPE stand for? Recap knowledge covered during previous lesson about ferrous and non-ferrous metals Workshop safety recap Reading an orthographic drawing</p>	<p>Orthographic Tolerance Accuracy Scriber Try square Steel rule Marking blue Filing Shearing Radius</p>	<p>Brain dump task</p> <p><b>BRAIN DUMP</b></p>  <p>Students to write in their books, in mind map form, everything they remember from the topic covered during last lesson/researched from KO.</p>	<p>M1 - You are able to select appropriately from specialist tools i.e. scriber M2 - You are able to select appropriately from specialist techniques and processes M3 - You understand different materials based on their properties, such as malleability M4 - You can explain and follow safety rules and procedures M5 - You demonstrate the ability to use complex materials i.e. plywood M6 - You have demonstrated use of a broad range of processes and techniques M9 - You have demonstrated the ability to mark out accurately on different materials</p>		

		How to understand what dimension something is			<p>T1 - Types of materials e.g wood, metal, plastic and textiles T2 - Material properties T4 - Safety and risk assessment</p> <p><b>Retrieval practice:</b> Recap knowledge, through LSTs and questioning, of; hardness, toughness, malleability, ferrous and non-ferrous and marking out accurately.</p>		
<b>Week 3</b>	<p>Steel letter holder – Shearing and filing <b>*Teacher demo*</b></p> <p>Steel coat hook – Measuring and marking out Annealing steel</p>	<p><b>Intentions</b></p> <ul style="list-style-type: none"> <li>- Understand how to join steel using the brazing process</li> <li>- Learn how annealing steel makes it more malleable</li> </ul> <p><b>Questions</b> Recap knowledge from last lesson including tolerances, safety, PPE as well as ferrous and non-ferrous metals.</p> <p>Recap knowledge about marking out accurately and tool names Students continue marking out letter holder Teacher to demonstrate how to use the metal bender safely shear metal</p> <p>Students mark out the standard back shape and hook. Demonstrate cross and draw filing to remove burrs and meet marked lines.</p> <p>Demonstrate brazing to aid a key hook. <b>*may require spot welding first if using flat bar*</b> Demonstrate bending the main hooks into shape. Students complete. Students to sand surfaces of material in preparation for joining components together</p> <p>Health and safety and PPE</p>			<p>M1 - You are able to select appropriately from specialist tools i.e. scribe M2 - You are able to select appropriately from specialist techniques and processes M3 - You understand different materials based on their properties, such as malleability M4 - You can explain and follow safety rules and procedures M5 - You demonstrate the ability to use complex materials i.e. plywood M6 - You have demonstrated use of a broad range of processes and techniques M9 - You have demonstrated the ability to mark out accurately on different materials</p> <p>T1 - Types of materials e.g wood, metal, plastic and textiles T2 - Material properties T4 - Safety and risk assessment</p> <p><b>Retrieval practice:</b> Recap knowledge, through LSTs and questioning, of; hardness, toughness, malleability, ferrous and non-ferrous and marking out accurately.</p>		
<b>Week 4</b>		<p><b>Intentions</b></p> <p>How to apply a surface finish to metal to prevent corrosion Understand the process of powder coating</p>	<p>Powder coating Corrosion Polymer Plastic</p>				

		Complete manufacture. Draw file edges. Clean up brazed area. Demonstrate how to heat metal to the correct temperature and use plastic 'hot dip' method to finish metal					
<b>Week 5</b>		<p><b>Intentions</b></p> <p>Be aware of the natural strength different shapes provide a structure Be able to use ties and struts to strengthen a structure</p> <p>Structures and strength Forces and stresses</p> <p><i>*Follow questions from ppt*</i></p>	<p>Tension Tensile strength Compression Torsion Load Biomimicry</p>				
<b>Week 6</b>		<p><b>Intentions</b></p> <p>Apply knowledge of structures and forces to design and make a model bridge Apply the concept of struts and ties to reinforce the bridge and add strength</p>	<p>Tension Tensile strength Compression Torsion Load Biomimicry</p>				
<b>Week 7</b>		<p>Bridge model using lollipop sticks Continue and complete bridge model</p>					
<b>Half term</b>							