

Subject :	Engineering	Year Group:	11
Scheme title	2.3 Unit R109: Engineering materials, processes and production	SOW being updated	SOW being updated
Purpose of scheme	To ensure that all pupils the technical and practical expertise needed to perform everyday tasks confidently and to participate successfully in an increasingly technological world. To build and apply a repertoire of knowledge, understanding and skills in order to make high-quality prototypes and products	SOW being updated	SOW being updated
Knowledge in sequence	Unit R109 will develop learners' knowledge and understanding of engineering materials and processes, and their application in the manufacture of engineered products. The content of this unit includes basic engineering processes, allowing for a practical approach to be taken in the delivery of the unit. This unit also covers types of engineering materials such as ferrous and non-ferrous metals, alloys, polymers, thermosetting plastics, ceramics, composites, smart materials and new and emerging materials. Learners will understand properties of engineering materials and learn the theory of hand and machine skills to engineer a product. On completion of this unit, learners will understand how the properties and characteristics of materials impact on the design specification for the development of a new product and appreciate the different production methods available to produce engineered products.	SOW being updated	SOW being updated
Skills	Learners should complete the learning unit R109 before completing assessment of the other 3 units (R110, R111, R112) within this qualification, as teaching of this unit will develop key knowledge, skills and understanding which will be applied and assessed throughout the other units. In Unit R109, learners will develop the following knowledge, skills and understanding which can be applied to all other optional units within the qualification, such as; In unit R111 - learners may build on their learning from R109, relating to engineering materials and their characteristics and of the applications of computer-controlled production processes, (CNC) machining processes, for the manufacture of their product components. In unit R112 - learners may build on their learning from R109 relating to quality control checks. Learners will understand 'quality control checks to review finished preproduction products' which can be applied in in this unit	SOW being updated	SOW being updated
Key Words	Ferrous Metals Those Metals Contain IRON (Fe). Non-ferrous Metals Metals which do not contain IRON Alloys A mixture. of two or more metals. Thermoplastics Can be remoulded numerous times with the application of heat. Thermoset Plastics Polymers which cannot be remoulded once set in shape. Ceramics Products made from clay and similar inorganic materials (sand), products such as pottery, brick, cement or glass. Composites A material made from two or more different materials that, when combined, are stronger than those individual materials by themselves. Smart Material Materials which have properties that can be significantly changed in a controlled fashion by external stimuli, such as heat, moisture, electric or magnetic fields, light. New / Modern Materials A modern material is a material that has been engineered to have improved properties Malleability Is capable of being extended or shaped by beating with a hammer or by the pressure of rollers. Ductility The ability of a material to be drawn out into wire or thread without losing strength or breaking. Conductivity Measure of a material's ability to conduct an electric current. Resistivity A measure of the resisting power of a specified material to the flow of an electric current. Hardness The measure of the resistance of a material to surface indentation, abrasion, or scratching. Machinability A characteristic of a metal that makes it easy to drill, shape, cut, grind, etc. Corrosion Resistance	SOW being updated	SOW being updated
	How well a metal can withstand damage caused by oxidization or other chemical reactions. Elasticity The ability of a metal to resume its normal shape after being stretched or compressed. Plasticity Is the ability of a metal to undergo permanent deformation, a non-reversible change of shape. Tensile A rope is in "tension" as it is pulled apart. This stretching puts the rope in tension. Compression This is a squashing / squeezing force where a body is pushed against itself. Impact The action of one object coming forcibly / hitting into another object. Destructive Testing Carried to find properties and behaviour of materials under different loads and conditions. The material is damaged during the test. Non-Destructive Testing (NDT) A testing technique used by engineers to evaluate the properties of a material or product without causing damage to the original product Standard Stock Shapes Most materials are produced in standard sizes enabling them to be easily used across industries. Knowing what shapes and sizes are available makes designing, buying and tooling easier.		
End Point	R111 and R112 end of Year 11	SOW being updated	SOW being updated
Assessment method	Working through the associated booklet generated for Unit R109 contains past paper examples for each material category which pupils work on after the knowledge has been delivered. Assessment using Past Paper questions to be carried out at the end of each Half Term. Lesson 7 / Lesson 14 / Lesson 19 / Lesson 26. Final 1-hour examination (6 questions) Questions 1 & 2 – Lo1 Question 3 – Lo2 Question 4 & 5 – Lo3 Question 6 – Lo4 Synoptic Learning; Learners will be able to apply knowledge and understanding gained in this unit to help develop their skills further during the completion of Units R110, R111 and R112.(NEA) and vice versa.	SOW being updated	SOW being updated