INTENT: Curriculum Overview (Year 12) A Level Design Technology – Product Design

A learner in Year 12 will know: a range of materials and components used in the manufacture of commonly available products, and will know to make critical comparisons between them.			A learner in Year 12 will be able to: build a framework for analysing existing products that enables them to make considered selections of appropriate materials and manufacturing processes when designing.		
A: 2g Product Design knowledge	B: NEA preparation	C: NEA	D: Maths knowledge	E: Topic/Theme	F: Topic/Theme

Term 1	1:1: 2g Product Design knowledge Maths knowledge NEA preparation	1:2: 2g Product Design knowledge Maths knowledge NEA preparation	Autumn % Assessment
	Knowledge: 5.1 What factors influence the selection of polymers that are used in products? 5.2 What polymers should be selected when designing and manufacturing products and prototypes in product design? 5.3 Why is it important to consider the properties/characteristics of polymers when designing and manufacturing products? 7.1 How can polymers and their processes be used to make iterative models? 7.2 How can polymers and their processes be used to make final prototypes? 7.3 How can polymers and their processes be used to make commercial products? 7.4 How is manufacturing polymer products organised and managed for different scales of production? 7.5 How is the quality of polymer products controlled through manufacture? 1.1 What can be learnt by exploring contexts that design solutions are intended for? 1.2 What can be learnt by undertaking stakeholder analysis? 1.3 How can usability be considered when designing prototypes? 2.1 Why is it important to analyse and evaluate products as part of the design and manufacturing process? 2.2 Why is it important to understand technological developments in product design? M1 – Using numbers and percentages Skills: Demonstrate how designers discriminate between different polymers in order for them to be chosen appropriately for their properties, including: v. thermopolymers and thermosetting polymers, such as: PET, HDPE, PVC, LDPE, polypropylene, polystyrene and ABS; urea formaldehyde, epoxy resin and polyester resin.	Knowledge: 5.1 What factors influence the selection of metals that are used in products? 5.2 What metals should be selected when designing and manufacturing products and prototypes in product design? 5.3 Why is it important to consider the properties/characteristics of metals when designing and manufacturing products? 7.1 How can metals and their processes be used to make iterative models? 7.2 How can metals and their processes be used to make final prototypes? 7.3 How can metals and their processes be used to make commercial products? 7.4 How is manufacturing metal products organised and managed for different scales of production? 7.5 How is the quality of metal products controlled through manufacture? 2.3 Why is it important to understand both past and present developments in product design? 2.4 What can be learnt by examining lifecycles of products? 3.1 What factors need to be considered whilst investigating design possibilities? 3.2 What factors need to be considered when developing design solutions for manufacture? M2 – Ratios and percentages Skills: Demonstrate how designers discriminate between different polymers in order for them to be chosen appropriately for their properties, including: iii. ferrous and non-ferrous metals, such as: cast iron, mild steel and stainless steel; aluminium and copper iv. metal alloys, such as: brass, bronze and tungsten	Knowledge coverage: 5 & 7 – Polymers and their processes 5 & 7 – Metals and their processes 1 – Identify requirements 2 – Learning from existing products and practise M1 – Using numbers and percentages M2 – Ratios and percentages Skills tested: 3 week induction project : Peeler – modelling skills Polymers project: various – polymer product manufacturing skills Metals project: wind chime & dice – metal product manufacturing skills Assessment style/questions: Selected questions from sample 1 & 2 - paper 1 Name one thermopolymer that is suitable for the foam liner of the bicycle helmet and explain why this could be used. Bicycle helmets are often ventilated by holes through the shell and the foam liner. The use of Polycarbonate for the shell material enables larger ventilation holes than when PET is used as the shell material. Explain two reasons why Polycarbonate is a more suitable material than PET where large ventilation holes are required. A company needs to order a minimum of 730 torches, but no more than 800 torches.

	Demonstrating commercial production processes and machinery used to manufacture products to different scales of production, including: i. moulding methods, such as injection, rotational, compression, extrusion and blow ii. thermoforming and vacuum forming Demonstrate how the design of jigs, fixtures, presses, formers and moulds in commercial production Formative Assessment: Bi-weekly pit stop to assess understanding of knowledge covered. Pit 1 – Types of polymers (10 marks) Pit 2 – Polymer manufacturing processes (10 marks) Pit 3 – M1 (10 marks) End point: Students can understand, analyse and respond to exam style questions based on the topics covered. Students can understand that 3D iterative models can be made from polymers and components to create block models and working prototypes to communicate and test ideas, moving parts and structural integrity.	Demonstrating commercial production processes and machinery used to manufacture products to different scales of production, including: iii. die casting and sand casting iv. sheet metal forming and stamping Demonstrate how the design of jigs, fixtures, presses, formers and moulds in commercial production Formative Assessment: Bi-weekly pit stop to assess understanding of knowledge covered. Pit 1 – Types of metals (10 marks) Pit 2 – Metal manufacturing processes (10 marks) Pit 3 – M2 (10 marks) End point: Students can understand, analyse and respond to exam style questions based on the topics covered. Students can understand that 3D iterative models can be made from metals and components to create block models and working prototypes to communicate and test ideas, moving parts and structural integrity.	Using the information in Fig. 1.2, calculate which quantity of torches within this range will offer the lowest total cost. Show your working. There is a social pressure to reduce the use of 'single-use' plastic products and packaging. Discuss the reasons for this and the impact it is having on manufacturers. Use examples of products you are familiar with to support your response.
Term 2	2:1 2g Product Design knowledge Maths knowledge NEA preparation	2:2: 2g Product Design knowledge Maths knowledge NEA preparation	Spring % Assessment
	Knowledge: 5.1 What factors influence the selection of timbers that are used in products? 5.2 What timbers should be selected when designing and manufacturing products and prototypes in product design? 5.3 Why is it important to consider the properties/characteristics of timbers when designing and manufacturing products? 7.1 How can timbers and their processes be used to make iterative models? 7.2 How can timbers and their processes be used to make final prototypes? 7.3 How can timbers and their processes be used to make commercial products? 7.4 How is manufacturing timber products organised and managed for different scales of production? 7.5 How is the quality of timber products controlled through manufacture? 3.3 What factors need to be considered when manufacturing products?	Knowledge: 5.1 What factors influence the selection of smart and modern materials that are used in products? 5.2 What smart and modern materials timbers should be selected when designing and manufacturing products and prototypes in product design? 5.3 Why is it important to consider the properties/characteristics of smart and modern materials when designing and manufacturing products? 7.1 How can smart and modern materials be used to make iterative models? 7.2 How can smart and modern materials be used to make final prototypes? 7.3 How can smart and modern materials be used to make commercial products? 4.3 How do product designers use different approaches to design thinking to support the development of design ideas? 8.1 How can designers assess whether a design solution meets its stakeholder requirements?	Knowledge coverage: 5 & 7 – Timbers and their processes 5 & 7 – Smart and modern materials 3 – Implications of wider issues 4 – Design thinking and communication 8 – Viability of design solutions 9 – Health & safety M3 – Calculating surface areas and volumes M4 – Use of trigonometry Skills tested: Timbers project: joints – timber product manufacturing skills Mixed materials project: LED lamp – product manufacturing skills Assessment style/questions: Selected questions from sample 1 & 2 - paper 1

	3.4 What factors need to be considered when distributing products to markets? 3.5 How can skills and knowledge from other subject areas, including mathematics and science, inform decisions in product design? 4.1 How do product designers use annotated 2D and 3D sketching and digital tools to graphically communicate ideas? 4.2 How do industry professionals use digital design tools to support and communicate the exploration, innovation and development of design ideas? M3 – Calculating surface areas and volumes Skills: Demonstrate how designers discriminate between different polymers in order for them to be chosen appropriately for their properties, including: i. hardwoods and softwoods, such as: oak, teak and beech; pine, spruce and fir ii. manufactured boards, such as: plywood, MDF and block board Demonstrate methods of joining similar and similar materials within products to fulfil the following functions: i. permanently joining materials to include constructional joints ii. temporarily/semi-permanently joining materials iii. adhesion and heat iv. using standard components and fixings. Formative Assessment: Bi-weekly pit stop to assess understanding of knowledge covered. Pit 1 – Types of timbers (10 marks) Pit 2 – Timber manufacturing processes (10 marks) Pit 3 – M3 (10 marks) End point: Students can understand, analyse and respond to exam style questions based on the topics covered. Students can understand that 3D iterative models can be made from timbers and components to create block models and working prototypes to communicate and test ideas, moving parts and structural integrity.	8.2 How can product designers and manufacturers assess whether a design solution meets the criteria of technical specifications? 8.3 How do designers and manufacturers determine whether design solutions are commercially viable? 9.1 How can safety be ensured when working with materials in a workshop environment? 9.2 What are the implications of health and safety legislation on product manufacture? M4 – Use of trigonometry Skills: Demonstrate how designers discriminate between different smart and modern materials in order for them to be chosen appropriately for their properties, including: vi. natural and synthetic fibres, such as: cotton, wool and silk; polyester and nylon vii. textile fabrics, such as: woven, non-woven, knitted and blended textiles viii. composite materials, such as: fibre-reinforced plastics, glass-reinforced plastics (GRP) and carbon fibre (CFRP) ix. modern materials, such as: e-textiles, super-alloys, graphene, bioplastics and nanomaterials x. smart materials, such as: thermochromic, photochromic and electrochromic materials; shape memory alloy and shape memory polymers; conductive paints and e-textiles. Formative Assessment: Bi-weekly pit stop to assess understanding of knowledge covered. Pit 1 – Types of smart materials (10 marks) Pit 2 – Types of modern materials (10 marks) Pit 3 – M4 (10 marks) End point: Students can understand, analyse and respond to exam style questions based on the topics covered. Students can understand that 3D iterative models can be made from a range of materials and components to create block models and working prototypes to communicate and test ideas, moving parts and structural integrity.	Explain why a woven fabric is more suitable for the chin strap than a knitted or non-woven fabric. After user testing, it has been decided that the dimensions of the pot need to be adjusted. The radius at the top of the pot is 38mm, the height is 90mm and there are 5° draft angles on the sides. Calculate the radius of the base of each pot. The deck of the skateboard shown in Fig. 4.1 and Fig. 4.2 forms the base that people stand on when in use. Name one suitable hardwood for use in the manufacture of the deck shown in Fig. 4.2 and explain why this would be used. Explain, using sketches and/or notes, the process that would be used to manufacture the skateboard deck as shown in Fig. 4.1 and Fig. 4.2 as a batch of 2000. Give details of any specialist tooling and quality control checks that would be used.
Term 3	3:1: Maths knowledge NEA	3:2: Maths knowledge NEA	Summer % Assessment

	Knowledge: NEA - Exploring & analysing possible contexts NEA - Chosen Context and Possible Opportunities NEA - Design Brief NEA - User/Stakeholder needs NEA - Existing products NEA - Relevant research M5 – Use and analysis of data, charts and graphs Skills: Disassembly, testing, and comparison of similar products, components and materials will highlight strengths and weaknesses and support technical understanding, but it is important to be in direct contact with a user and/or wider stakeholders that can offer meaningful feedback to support explorations and testing throughout. Communicating with users and wider stakeholders will support explorations into the opportunities and constraints of developing a product. It is expected that learners give consideration to the wider functionality when designing products, for example, how they may be stored, moved or transported and maintained or adapted to achieve function and fitness for purpose. Formative Assessment: Bi-weekly pit stop to assess understanding of knowledge covered. Pit 1 – Health & Safety (10 marks) Pit 2 – Key words 1 (10 marks) Pit M5 – (10 marks) End point: The Iterative Design Project is a substantial design and make project that is individual to each learner and follows the methodology of iterative designing. Learners will be required to explore contexts of their own choosing that are both contemporary and challenging. The focus should be on identifying problems and opportunities to be resolved in an innovative way within the endorsed title they are working in. The undertaking of their project should demonstrate their self-management and a clear and thorough understanding of iterative design processes in practice. Learners will need to demonstrate their knowledge, understanding and skills through overlapping, repeated iterative processes that:	Knowledge: NEA - Useful Measurements NEA - Stakeholder Requirements NEA - Design specification NEA - Design ideas M6 – Coordinates and geometry Skills: Communicating with users and wider stakeholders will support explorations into the opportunities and constraints of developing a product. It is expected that learners give consideration to the wider functionality when designing products, for example, how they may be stored, moved or transported and maintained or adapted to achieve function and fitness for purpose. It is expected that learners will reflect commercial practice by including marketing aspects in their design thinking at all stages of the iterative process, to ensure their final product will be marketable and ready for market. Formative Assessment: Bi-weekly pit stop to assess understanding of knowledge covered. Pit 1 – Key words 2 (10 marks) Pit 2 – M6 (10 marks) End point: The Iterative Design Project is a substantial design and make project that is individual to each learner and follows the methodology of iterative designing. Learners will be required to explore contexts of their own choosing that are both contemporary and challenging. The focus should be on identifying problems and opportunities to be resolved in an innovative way within the endorsed title they are working in. The undertaking of their project should demonstrate their self-management and a clear and thorough understanding of iterative design processes in practice. Learners will need to demonstrate their knowledge, understanding and skills through overlapping, repeated iterative processes that: • 'explore' needs • 'create' solutions that demonstrate how the needs can be met, and • 'evaluate' how well the needs have been met.	Knowledge coverage: 2g. Product Design knowledge M5 – Use and analysis of data, charts and graphs M6 – Coordinates and geometry Skills tested: In the written examinations, all learners are required to demonstrate their mathematical skills and scientific knowledge as applied to design and technology practice. The content of this component is focused towards products and applications and their analysis in respect of: • materials, components and their selection and uses in products/systems • industrial and commercial practices • wider issues affecting design decisions. Assessment style/questions: June 2019 paper 1 (To add when paper published electronically)

	• ‘explore’ needs • ‘create’ solutions that demonstrate how the needs can be met, and • ‘evaluate’ how well the needs have been met.		