



Dallam School

Curriculum Overview

Department: A-level Product Design
Year Group: 12

AUTUMN		SPRING		SUMMER	
Half term 1	Half term 2	Half term 3	Half term 4	Half term 5	Half term 6
<u>Designing and Making Principles (Paper 2)</u> Design methods and processes Design theory Technology and cultural changes Design processes Critical analysis and evaluation Selecting appropriate tools, equipment and processes Accuracy in design and manufacture Skills Project: Emergency Shelters (Research, Design skills and Prototype Manufacture)	<u>Technical Principles (Paper 1)</u> Materials and their applications Testing materials Performance characteristics of materials: Polymers Metals Timber Smart Materials Papers and Boards Composites Polymer based sheet and film Biodegradable polymers Modern materials Skills Project: Emergency Shelters (Research, Design skills and Prototype Manufacture) CAD Development 2D Design – Winter small project	<u>Designing and Making Principles (Paper 2)</u> Responsible design Design for manufacture Product Life Cycle <u>Technical Properties (Paper 1)</u> Enhancement of materials Forming, redistribution The use of finishes Modern and industrial commercial practice Digital design and manufacture Product design and development Health and safety Design for manufacturing, maintenance, repair and disposal Enterprise and marketing in the development of products Skills Project Design and make task based on a design movement	<u>Technical Principles (Paper 1)</u> Design communication Scales of Production <u>Designing and Making Principles (Paper 2)</u> Design processes iterative design in commercial contexts Introduction to NEA – Context Analysis Feasibility Plan User/Client Interviews Skills Project Design and make task based on a design movement	<u>Designing and Making Principles (Paper 2)</u> National and international standards in product design NEA – Environment/Site study Existing Solutions Brief and Objective Skills Project Design and make task based on a design movement	<u>Technical Principles (Paper 1)</u> Modern and industrial commercial practice Digital design and manufacture NEA – Research Plan User/Client Profile Materials and Manufacture Anthropometrics and Ergonomics

By the end of this half term pupils will know (*key knowledge, including tier 3 vocabulary*)

<p>Students should be aware of, and able to explain, different approaches to user centred design. That in approaching a design challenge there is not a single process, but that good design always addresses many issues</p> <p>Students should be aware of, and able to discuss, how key historical design styles, design movements and influential designers that have helped to shape product design and manufacture.</p> <p>Students should be aware of, and be able to discuss, the work of influential designers and how their work represents the principles of different design movements</p> <p>market research interviews human factors focus groups product analysis and evaluation the use of anthropometric data and percentiles the use of ergonomic data arts and craft movement Art Deco Modernism, eg Bauhaus Post modernism, eg Memphis.</p>	<p>Students are expected to be able to name specific materials for a wide range of applications.</p> <p>They must also be able to provide detailed and justified explanations of why specific materials and combinations of materials are suitable for given applications, with reference to:</p> <p>physical and mechanical properties (working characteristics) product function aesthetics cost manufacture and disposal.</p> <p>Students should know and understand the classifications of materials and be able to name examples that belong to each category – metals, woods, polymers, papers and boards, smart materials and modern materials</p> <p>Students should be able to describe how workshop and industrial tests are set up and what will be tested, measured and compared.</p> <p>Students should be able to describe the performance</p>	<p>Students are expected to be able to describe enhancement methods for given materials and explain their suitability for specific product applications.</p> <p>Students should be aware of the ways that different materials can be shaped into different products such as packaging.</p> <p>Students should be aware of how jigs and fixtures can be used to aid the manufacture of products.</p> <p>They should be able to describe them and explain their suitability for accurate and repeated manufacture of products.</p> <p>Students should be aware of the ways different materials can be finished to enhance their appearance or for improved function.</p> <p>Students should be aware of, and able to explain, health and safety procedures related to products and manufacturing</p> <p>Tier 3 Vocab:</p> <ul style="list-style-type: none"> ➤ die cutting ➤ laser cutting ➤ creasing ➤ bending ➤ vacuum forming 	<p>Students should be aware of, and be able to describe, the different scales of production giving example products and specific manufacturing methods.</p> <p>Students must develop an awareness of the relationship between material cost, form, and manufacturing processes, and the scale of production.</p> <p>The development of designs which use materials economically and with regard to their characteristics. The use of manufacturing processes which increase accuracy and reduce waste. The savings to be gained when comparing bulk production with one-off production. The advantages of Just In Time (JIT) manufacture.</p> <p>Students should be aware of, and able to explain and demonstrate the skills, in a range of communication and presentation techniques for conveying proposals and intentions to clients, potential users and manufacturers</p> <p>Students should be aware of, and able to discuss, how socio economic influences have helped to shape product design and manufacture</p> <p>Students should be aware of, and able to discuss, how major developments in</p>	<p>Students should be aware of, and able to discuss and demonstrate, good and safe working practices, including: the importance of using the correct tools and equipment for specific tasks</p> <p>the importance of ensuring their own safety and that of others when in a workshop situation</p> <p>how designs are developed from a single prototype into mass produced products</p> <p>the effect on the manufacturing process that is brought about by the need for batch and mass manufacture</p> <p>how to select the most appropriate manufacturing process to be able to realise their, or others', design proposals</p> <p>the importance of health and safety in a commercial setting including workforce training and national safety standards.</p> <p>Students should be aware of, and able to discuss and demonstrate, the importance of accuracy in manufacturing, whatever the scale of production, including: how testing can eliminate errors</p>	<p>Students should be aware of, and be able to describe the advantages and disadvantages of using CAD compared to a manually generated alternative</p> <p>The use of CAD to develop and present ideas for products, including: the use of 2D CAD for working drawings the use of 3D CAD to produce presentation drawings how CAD is used in industrial applications.</p> <p>Students should be aware of, and be able to describe, how CAM is used in the manufacture of products.</p> <p>Tier 3 Vocab:</p> <ul style="list-style-type: none"> ➤ laser cutting ➤ routing ➤ milling ➤ turning ➤ plotter cutting
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characteristics of all materials studied.

Tier 3 Vocab:

- Ferrous
- Non-ferrous
- Hardwoods
- Softwoods
- Manufactured boards
- Alloys
- Thermoplastics
- Thermoset polymers
- Elastomers
- Composites
- tensile strength
- toughness
- hardness
- malleability
- corrosion
- conductivity
- grain pattern
- grain direction
- surface defects
- warpage
- shrinkage
- splitting
- joining
- forming
- steam bending
- laminating
- machining
- qualities
- resistance to decay
- moisture resistance
- toxicity.

- thermoforming
- calendaring
- line bending
- laminating (layup)
- injection moulding
- blow moulding
- rotational moulding
- extrusion
- compression moulding.
- Knock-down fittings
- electro-plating
- dip coating
- powder coating
- galvanising
- copyright and design rights
- patents
- registered designs
- trademarks
- logos.

technology are shaping product design and manufacture

Students should be aware of, and able to discuss, the responsibilities of designers and manufacturers, including: products are made using sustainable materials and ethical production methods the development of products that are: culturally acceptable not offensive to people of different race, gender or religious belief the development of products that are inclusive the design and manufacture of products that could assist with social problems, eg poverty, health and wellbeing, migration and housing the impact of Fairtrade on design and consumer demand designing products to consider the six Rs of sustainability.

Students should be aware of, and able to discuss and implement, the stages of a range of design processes in order to apply personal judgement and relevant criteria in the appraisal of products and systems

Tier 3 Vocab:

- one-off, bespoke
- batch production
- mass/line production
- unit production systems (UPS)

the value in the use of measuring aids, eg templates, jigs and fixtures in ensuring consistency of accuracy and the reduction of possible human error.

Students should be aware of, and able to discuss, the importance of national and international standards in product design, including: British Standards Institute (BSI) International Organisation for Standardisation (ISO) Restriction of Hazardous Substances (ROHS) directive battery directive polymer codes for identification and recycling packaging directives WEEE directives energy ratings of products eco-labelling

- Total Quality Management (TQM)
- Six sigma
- Prototypes
- Production
- Destructive testing
- Non-destructive testing
- British Standards

			<ul style="list-style-type: none"> ➤ quick response manufacturing (QRM) ➤ vertical in-house production. ➤ micro electronics 		
They will understand (<i>key concepts</i>)					
<p>The design methods used in industry, history of design including technological advancements and cultural and socio-economic impact of design.</p> <p>The correct tools to use in design especially for accuracy in manufacture.</p> <p>How to avoid design fixation and be an innovative designer.</p> <p>Developing workshop skills</p>	<p>Materials including papers/boards, timbers, metals, polymers and their applications. The properties and characteristics of these materials and how they are tested,</p> <p>Prototype skills</p> <p>2D Design (CAD)</p>	<p>What is the Product Life Cycle</p> <p>How to design responsibly – impact on people, the environment</p> <p>How are different materials shaped and formed.</p> <p>Manufacture in industry – enterprise and marketing</p>	<p>What different ways are there to communicate designs</p> <p>What is iterative design</p> <p>What are the different scales of production and when are they used. What is the advantages and disadvantages of them</p> <p>How do designers decide what problems to solve in design and what is the research and development method</p>	<p>What are the different legislations designers and manufacturers have to adhere to</p>	<p>What is digital design and manufacture</p>
They will know how to (<i>key skills</i>)					
<p>Understand the impact their design can have on society/environment</p> <p>Follow the key steps in the design process</p>	<p>Critically evaluate products</p> <p>Work collaboratively – problem solving</p>	<p>Consider the impact on society and people of designs</p> <p>Understand which manufacturing technique is appropriate</p>	<p>Communicate designs using different strategies effectively</p> <p>Reflect on designs and make improvements</p>	<p>Ensure designs meet legislation</p>	<p>Understanding the use of CAD/CAM</p>



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<u>Technical Principles (Paper 1)</u> The requirements for product design and development Protecting designs and intellectual property	NEA – Design development Modelling/Prototypes Final Design CAD Manufacture	NEA – Manufacture Manufacturing plan Gantt Chart Cutting list Comparison to specification Modifications and Improvement	Revision for Exam Paper 1 Technical Principles and Paper 2 Designing and Making Principles	Revision for Exam Paper 1 Technical Principles and Paper 2 Designing and Making Principles	

<p>Design for manufacturing, maintenance, repair and disposal Feasibility studies Enterprise and marketing in the development of products Modern manufacturing systems</p> <p>NEA – Health and Safety Specification Initial Ideas</p>		<p>Client Feedback Strengths and Weaknesses</p> <p>HAND IN EASTER 2023</p>			
<p>By the end of this half term pupils will know (<i>key knowledge, including tier 3 vocabulary</i>)</p>					
<p>Students must develop an awareness of the relationship between material cost, form, and manufacturing processes, and the scale of production.</p> <p>The development of designs which use materials economically and with regard to their characteristics. The use of manufacturing processes which increase accuracy and reduce waste. The savings to be gained when comparing bulk production with one-off production. The advantages of Just In Time (JIT) manufacture.</p> <p>Students should be aware of, and be able to describe, how virtual modelling/testing is used in industry prior to product production.</p> <p>Tier 3 Vocab:</p> <p>➤ simulation</p>	<p>Students will be able to develop designs through CAD, modelling and sketching</p> <p>Creating a final design</p> <p>Manufacturing methods</p> <p>Plan view Orthographic Isometric CAD Render Dimensions Joints Finish</p>	<p>Manufacturing methods</p> <p>Being able to self-analyse own design and identify strengths and weaknesses</p> <p>To be able to liase with a client and gain feedback and criticism.</p> <p>Strengths Weaknesses Skills Evaluate Time management Tolerance Accuracy</p>			

<ul style="list-style-type: none"> ➤ computational fluid dynamics (CFD) as used for testing aerodynamics and wind resistance, and flow of liquids within/around products ➤ finite element analysis (FEA) as used in component stress analysis. 					
They will understand (<i>key concepts</i>)					
<p>How do designers protect their designs and intellectual property.</p> <p>How are products designed to be repaired, or for disposal</p>	<p>Be able to use their prior knowledge of different methods of prototyping</p> <p>Modelling designs and gaining and acting upon feedback from a client</p> <p>How to use CAD effectively in design</p>	<p>How to write a manufacturing plan and the need for accurate detail</p> <p>How and why manufacturers use cutting lists</p> <p>Self- analysis of design and manufacture</p>			
They will know how to (<i>key skills</i>)					
<p>Be innovative in design and protect designs from copyright</p> <p>Think about sustainability in design, so that products can be repaired or separated easily for recycling</p> <p>To write a specification based upon research</p> <p>How to avoid design fixation when creating designs</p>	<p>Develop and adapt prototypes</p> <p>Design and develop using CAD</p> <p>Liase with a client to meet their needs</p>	<p>Write a cutting list and manufacturing plan</p>			

