

SUMMER WORK Product Design - YEAR 12

Head of Department

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Exam Board

AQA

Specification

7552

COURSE DETAILS

Examination

The course is examined as a whole at the end of Year 13 over 2 exam papers (combined worth 50%) and the NEA (50%)

NEA – The NEA will begin in year 1 and will be completed in year 2. Practical activities will be carried out by students including some autonomous tasks and some focused practical tasks to prepare students for the self-directed NEA. The NEA is an iterative project where students are expected to explore the needs of intended users, generate solutions and continuously evaluate using third party feedback.

Theory

Paper 1 ‘Technical Principles’ – 30% of the overall A level. Examines the following units:

Unit 1 – Performance characteristics of papers and boards

Unit 2 – Performance characteristics of polymers

Unit 3 – Performance characteristics of woods

Unit 4 – Performance characteristics of metals

Unit 5 – Composite, smart and modern materials

Unit 6 – Processing and working with papers and boards

Unit 7 – Processing and working with polymers

Unit 8 – Processing and working with woods

Unit 9 – Processing and working with metals

Paper 2 ‘Designing & Making Principles’ - 20% of the overall A level.

Examines the following units

Unit 10 – Modern industrial and commercial practice

Unit 11 – Product design considerations

Unit 12 – Product design & development

Unit 13 – Design methods

Unit 14 – Design processes

Unit 15 – Responsible Design

SUMMER WORK FOR INTRODUCTION TO YEAR 12

TASK	TOPIC	
1.	Designers and Design Movements <i>See attachment to assist you.</i>	Produce a fact file/ top trumps cards on each of the following designers and design movements. These should include images, dates, key principles, materials, technologies and socio-economic influences as well as any other significant information. Designers should include examples and names of key work. <ul style="list-style-type: none"> Philippe Stark, James Dyson, Margaret Calvert, Dieter Rams (include each of his 10 principles), Charles & Ray Eames, Marianne Brandt Arts & crafts, Art Deco, Modernism (include Bauhaus), Streamlining, Post-Modernism (include Memphis)
2.	Key Organisations & Directives	Research the following organisations/ directives and complete a glossary table to give an overview of their purpose. Include drawings / images of any relevant symbols and use key words/ short phrases only. Include where the symbols are commonly seen. <ul style="list-style-type: none"> BSI, ISO, RoHS, WEE, FSC, ELV, EC Energy Label, Battery Directive, Mobius Loop, SPI codes (polymer identification codes), NAPM recycle mark, EU energy star.
3.	Common materials, uses and properties <i>See attached tables for completion</i>	Research and produce a page for each of the following material areas including images of the materials in use and relevant properties: <ul style="list-style-type: none"> Polymers Metals Timbers

		<ul style="list-style-type: none"> Papers & Boards
4.	<p>Common processes</p> <p>See video links below</p>	<p>Research the processes and watch suggested video clips (below) for each of the following manufacturing processes.</p> <p>Produce a flowchart of stages and a diagram for each process.</p> <p><i>Polymers</i></p> <ul style="list-style-type: none"> vacuum forming • thermoforming • calendaring • line bending • laminating (laying up) injection moulding • blow moulding • rotational moulding • extrusion • compression moulding. 3D printing/ Rapid Prototyping (Fused Deposition Modelling/ FDM only) <p><i>Metals</i></p> <ul style="list-style-type: none"> press forming • spinning • cupping • deep drawing • forging • drop forging • bending rolling • casting: • sand casting • die casting • investment casting • low temperature casting (pewter). <p><i>Timbers</i></p> <ul style="list-style-type: none"> laminating • steam bending • machine processes: • turning between centre • milling • routing to produce slots, holes and profiles. <p><i>Papers and boards</i></p> <ul style="list-style-type: none"> die cutting • laser cutting
5.	Industrial systems	<p>Research and produce a revision card for each of the following industrial systems:</p> <ul style="list-style-type: none"> JIT, Flexible manufacturing systems, Scrum, Six Sigma, TQM, PPC, MPS, EPOS, QRM, UPS.

WIDER READING TO PREPARE FOR COURSE

- Making It: Manufacturing Techniques for Product Design - Chris Lefteri
- Design: The Definitive Visual History – DorlingKindersley
- Inclusive Design Toolkit Issue 1-4 http://www.inclusivedesigntoolkit.com/VBA_bulletin_issue_1/
- Inclusive Design Calculator http://www.inclusivedesigntoolkit.com/VBA_bulletin_issue_3/#nogo
- Exploded Drawing Technique <https://www.youtube.com/watch?v=qr4V8Nr9FaI>

ESSENTIAL

- AQA A Level Specification (attached)
- Iterative Design in Action <https://www.youtube.com/watch?v=Rnsk5IA52ps>
- The Inclusive Design Toolkit <https://www-edc.eng.cam.ac.uk/downloads/idtoolkit.pdf>
- Re-thinking Process: The Circular Economy <https://www.youtube.com/watch?v=zCRKvDyyHmI>
- Innovation Students of Product Design (Ep 1-4) <https://www.youtube.com/watch?v=CnKeVs-9zs>

Helpful websites:

- www.technologystudent.com

Part 4 Assistance - Processes clips:

Timbers

- <https://www.youtube.com/watch?v=vVswXx2m3eI&t=166s> - Laminating plywood with a vacuum bag
- <https://www.youtube.com/watch?v=YHP0STc3Ghg> – routing
- <https://www.youtube.com/watch?v=S8cQz4rSit8> – laminating veneers
- <https://www.youtube.com/watch?v=ZD5JWP3qDdg> – steam bending
- <https://www.youtube.com/watch?v=TeOlnBNEdjw> - turning

Polymers

- <https://www.youtube.com/watch?v=AZyq3TqskAY> – plastic bad production (includes calendaring)
- <https://www.youtube.com/watch?v=SqyrJUNhXwg> – extrusion
- <https://www.youtube.com/watch?v=xim1m2Bhvzc&feature=youtu.be> – injection moulding
- <https://www.youtube.com/watch?v=8W6P5KU5ONQ> – blow moulding
- <https://www.youtube.com/watch?v=xc9pKiV5wag> – rotational moulding
- https://www.youtube.com/watch?v=wYb_UjgJ5E0 – laying up (GRP)
- <https://www.youtube.com/watch?v=p5MOYI2BUjE> - thermoforming
- https://www.youtube.com/watch?v=ik39_sv-wgQ – FDM Rapid Prototyping (3D printing)

Metals

- <https://www.youtube.com/watch?v=r6U6P0Y0bRw> – deep drawing
- <https://www.youtube.com/watch?v=LlRof0K00Q> – die casting
- <https://www.youtube.com/watch?v=lZvP6Jj3HvY> – gravity die casting
- <https://www.youtube.com/watch?v=iSyBsdJkQu8> – high pressure die casting
- <https://www.youtube.com/watch?v=npHQPXGGkgI> – investment casting
- <https://www.youtube.com/watch?v=npHQPXGGkgI> – press forming type 1
- https://www.youtube.com/watch?time_continue=1&v=5CuJjSk4U38 – press forming type 2
- <https://www.youtube.com/watch?v=43N44lCyuEU> – metal spinning
- https://www.youtube.com/watch?v=szOwGvYO_Tc – sand casting
- https://www.youtube.com/watch?v=6xnKmt_gsLs – rolling
- <https://www.youtube.com/watch?v=Sbs5BjM4wgk> – milling



Papers & Boards




- <https://www.youtube.com/watch?v=kaokWmrslc> - Die Cutting
- https://www.youtube.com/watch?v=SljUVCho_xU – laser cutting





TV documentaries:



- Rams: Principles of good design
- Bauhaus 100 <https://www.bbc.co.uk/programmes/m0007trf>


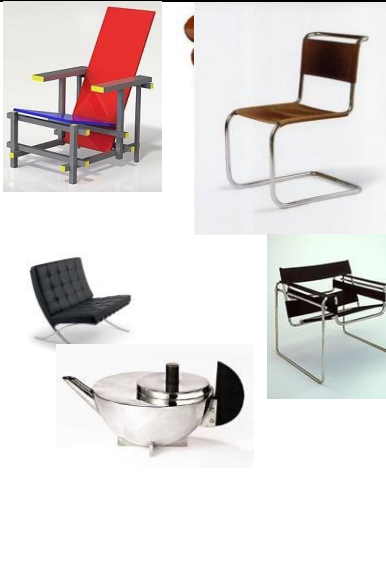

Part 1 assistance
Designers & Design Movements

Designer	Images	Key facts
<p>Phillipe Starck</p>		<ul style="list-style-type: none"> • He aims to enhance user experience and bring humour to everyday tasks- products are typically form over function and aesthetically pleasing • Thought provoking, playful designs • He was appointed the artistic director for the French presidency of the European Union in 2008. • He was named the Ambassador of Creativity and Innovation for France. • His most famous work are his designs for Alessi • His father was an aeronautical engineer and his mother was a painter, potentially inspiring his designs. • As a child, he deconstructed objects such as bicycles to observe their parts understand their functions. • His first major interior design project involved refurbishing private apartments for the French president. Other notable interiors he designed include the Paramount and Royalton Hotels in New York and Café Costes in Paris. • He has designed various products including the Microsoft optical mouse, Puma shoes, Samsonite luggage, Fossil watches, Bénéteau boats, Glacier water bottles, Thompson Multimedia televisions, and Aprilia motorcycles. • He designs objects to the best of their means, always economical and never wasteful. He believed that before being beautiful, something must first be useful. This is best seen in the products he has designed, which are affordable and found in mass-market venues.
<p>James Dyson</p>		<ul style="list-style-type: none"> • Dyson did courses in interior design and furniture design from the Royal College of Art from 1966 to 1970. • He considers the cost, durability and environmental impact of his company and his products. • He uses responsibly sourced suppliers who follow the ethical and environmental code of conduct which covers a range of subjects including working hours, freedom of association, environmental monitoring and fair discipling practices. • While he was there he got his first idea of using cyclonic separation in a vacuum cleaner so that it would not lose its suction quality as it picked up dirt. Dyson was very disappointed from his Hoover Junior that continuously got clogged up reducing its suction after every use. After five years of creating over 5000 prototypes, he finally launched the 'G-Force' cleaner in 1983. To his disappointment no manufacturer or distributor was interested in his idea, so he decided to launch his product in Japan. • Dyson got this technology patented in 1986. After not getting a positive response from the major manufacturers, he decided to establish his own manufacturing company in England. He got his first breakthrough from his television advertisement that had the slogan 'say goodbye to the bag' a quality that attracted customers more than the efficient suction quality of the product. • The Dyson Dual Cyclone turned out to be the fastest selling vacuum cleaner in the United Kingdom. When he launched his product in America in 2002 it was an instant success and in just three years managed to capture 20% of the market.

<p>Margaret Calvert</p>		<ul style="list-style-type: none"> • Was famous for designing UK road signs- used simple pictograms and typefaces to reduce distractions to make the signs easy to understand. The signs use a font called Transport (easy to read) • Was appointed graphic design consultant to the Anderson Committee, followed by the 'Worboys' Committee, by the UK government • She has designed commercial fonts for Monotype, including the eponymous Calvert font, which she created in 1980 for use on the Tyne and Wear Metro system • She was awarded an Honorary Fellowship by the University of the Arts London in 2004, and has a Senior Fellowship from the Royal College of Art. She also has an Honorary Doctorate from the University of Brighton
<p>Dieter Rams</p>		<ul style="list-style-type: none"> • According to Dieter Rams, good design: is innovative; makes a product useful; is aesthetic; makes a product understandable; is unobtrusive; is honest; is long-lasting; is thorough down to the last detail; is environmentally friendly; involves as little design as possible • Shortly after graduating with honours, he took a position with a Frankfurt-based architect. • He moved on to worldwide consumer products company Braun as an architect and designer, where he took an artistic approach to product design, creating items that were forward-thinking in both their functionality and technology. <p>10 principles:</p> <ol style="list-style-type: none"> 1. Innovative- appropriate use of modern materials, tech and approaches 2. Makes a product useful- it successfully solves the particular design problem for the consumer's benefit 3. Aesthetic- Well-executed, beautiful products in accordance with 'form follows function' principles 4. Understandable- Intuitive to use with no distracting elements that may cause confusion 5. Unobtrusive- Neutral and restrained without obtrusive decorations or detail 6. Honest- not deceive customers 7. Has longevity- design products that will continue to be useful over time 8. Thorough down to the last detail- Consider every element of design to ensure they function well 9. Environmentally friendly- use sustainable materials and processes in the development and production of products 10. Is as little design as possible- Include only essential elements in design
<p>Charles & Ray Eames</p>		<ul style="list-style-type: none"> • Charles Ormond Eames, Jr. trained in manufacturing and architecture. He grew up in Missouri, the country's industrial heartland. Bernice Alexandra "Ray" Kaiser trained in painting and sculpting. She began her career in New York, home to the art scene in America. • Before they applied their pioneering plywood moulding technique to furniture design, the Eameses used it to develop emergency transport splints for injured World War Two soldiers (as well as stretchers and experimental glider shells). The highly functional device was light and cheap to mass manufacture and, being modular, could be conveniently and inexpensively transported- thousands of the innovative, biomorphic designs were produced and shipped to the war zone, today they are frequently collected and displayed as artworks. • They are most famous for their iconic chairs, which transformed our idea of modern furniture, but this was merely one facet of their work. They were graphic and textile designers, architects and film-makers • Their mission statement was bold and simple: "We want to make the best for the most for the least." • Their designs were pleasing and accessible, attractive to young executives, not just artists and intellectuals. • Charles introduced modernist design to middle America, but it was Ray who softened its hard edges, and gave it mass appeal.

		<ul style="list-style-type: none"> • Their work remains the benchmark for all designers – not just for their aesthetic sense but for their irrepressible joie de vivre. Their mantras work just as well for any area of creativity: notice the ordinary; preserve the ephemeral; don't delegate understanding; explain it to a child.
Marianne Brandt	   	<ul style="list-style-type: none"> • She produced numerous designs in quick succession, which are numbered among the icons of "Bauhaus" design, such as her 1924 teapot and sieve. • From 1926 she was deputy head of the metalworking workshop- she was responsible for collaborative projects with industry. • For the lighting firm of Körting & Mathiesen she designed numerous lamps which were successfully produced, including, notably, the 1924 hanging ceiling lamp and the 1928 "Kandem" table lamp she designed in collaboration with Hin Bredendieck. • At the "Bauhaus" metalworking workshop, Marianne Brandt worked with Christian Dell, Hans Przyrembel, and Wilhelm Wagenfeld. • She had a brief stint working in Walter Gropius' Berlin architecture practice. There she mainly designed furniture for mass production and modular furniture while also working on the interior design of housing in Karlsruhe-Dammerstock. • Although she was extremely talented and successful at the "Bauhaus", she never managed to establish herself as a self-employed industrial designer.

Design Movement	Images	Key Facts
Arts and Crafts (1850 -1900)	 	<ul style="list-style-type: none"> • Inspired by socialist principles and led by William Morris, the members of the movement used the medieval system of trades and guilds to set up their own companies to sell their goods. Unfortunately, it had the reverse effect and, apart from the wealthy middle classes, hardly anyone could afford their designs. • Visually, the style has much in common with its contemporary art nouveau and it played a role in the founding of Bauhaus and modernism. • Style: handmade; simple forms with little ornamentation; beauty of natural materials; copper and pewter - often with a hammered finish; stylised flowers, allegories from the Bible and literature, upside down hearts, Celtic motifs • Influences; medieval styles - the Gothic revival led by AN Pugin; socialism - the ideas of John Ruskin and early Marx, especially the dehumanising effects of industrialization; the Orient - the pared-down quality of Japanese art • The Arts and Crafts movement was in fact comprised of a number of different artistic societies, such as the Exhibition Society, the Arts Workers Guild (set up in 1884), and other craftspeople in both small workshops and large manufacturing companies. • A feature of the Arts and Crafts movement was that a large proportion of its leading figures had trained as architects- helped develop a collective belief in the importance of designing objects for a 'total' interior: a space in which architecture, furniture, wall decoration, etc. blended in a harmonious whole. • Most Arts and Crafts designers worked across an unusually wide range of different disciplines: someone could apply craft-based principles to the design of things as varied as armchairs and glassware. • Arts and Crafts had a significant impact on architecture. Figures including Philip Webb, Edwin Lutyens, Charles Voysey and William Lethaby quietly revolutionised domestic space in buildings that referenced both regional and historical traditions. • Ideas and emphases of the movement: One cannot validly distinguish between fine and applied or decorative arts; the artisan or craftsman should have the same imaginative pleasure and freedom as painters, sculptors, and architects; the Industrial Revolution both greatly damaged popular taste and did much to destroy traditional craft skills; mid-nineteenth century design was by and large dreadful, and artists, sculptors, designers, craftsmen, theorists, and the buying public had work together to remedy this situation; properly designed objects should embody truth to; the role of the craftsman must be appreciated.

		<ul style="list-style-type: none"> • Key names: William Burges, E. W. Godwin, Charles Rennie Macintosh, F. W. Troup, Frank Lloyd Wright, C. F. A. Voysey and William Morris,
<p>Art Deco (1908 – 1935)</p>		<ul style="list-style-type: none"> • Art deco is a design style from the 1920s and 1930s in furniture, decorative arts and architecture characterised by its geometric character • Works exhibit aspects of Cubism, Russian Constructivism and Italian Futurism- with abstraction, distortion, and simplification, particularly geometric shapes and highly intense colours- celebrating the rise of commerce, technology, and speed. • It was popularly considered to be an elegant style of cool sophistication in architecture and applied arts which range from luxurious objects made from exotic material to mass produced, streamlined items available to a growing middle class. • Seen in furniture, pottery, textiles, jewellery, glass etc. it was also a notable style of cinema and hotel architecture • Named after the International Exhibition of Modern Decorative and Industrial Arts held in Paris in 1925 • Style: geometric and angular shapes; chrome, glass, shiny fabrics, mirrors and mirror tiles; stylised images of aeroplanes, cars, cruise liners, skyscrapers; nature motifs - shells, sunrises, flowers; theatrical contrasts - highly polished wood and glossy black lacquer mixed with satin and furs • Influences: art nouveau - deco kept the nature motifs of its predecessor but discarded its flowing organic shapes and pastels for bolder materials and colours such as chrome and black; cubism -painters such as Picasso were experimenting with space, angles and geometry; early Hollywood - the glamorous world of the silver screen filtered through to design using shiny fabrics, subdued lighting, and mirrors. Cocktail cabinets and smoking paraphernalia became highly fashionable.
<p>Modernism (1919 – 1933)</p>		<ul style="list-style-type: none"> • Modernism was generally based on idealism and a utopian vision of human life and society and a belief in progress • principles that define modernist art: A rejection of history and conservative values (such as realistic depiction of subjects); innovation and experimentation with form (the shapes, colours and lines that make up the work) with a tendency to abstraction; and an emphasis on materials, techniques and processes • was characterised by the deliberate departure from tradition and the use of innovative forms of expression that distinguish many styles in the arts and literature of the late nineteenth and the twentieth century • many artists started to make art based in their own, personal experiences and about topics that they chose • many artists began exploring dreams, symbolism, and personal iconography as avenues for the depiction of their subjective experiences, challenging the notion that art must realistically depict the world, some artists experimented with the expressive use of colour, non-traditional materials, and new techniques and mediums. Among these new mediums was photography, whose invention in 1839 offered radical possibilities for depicting and interpreting the world.
<p>Streamlining (1930-1944)</p>		<ul style="list-style-type: none"> • Grew out of the Art Deco style, but it was simplified and infused with a sense of dynamism that gave it huge commercial appeal • The style was as much about economics as aesthetics. The industrial design profession emerged at this time and used streamline design to serve American corporate capitalism. • Streamlining is the shaping of an object to reduce the amount of resistance it encounters when it travels through a medium like air or water. It occurs in nature: aquatic animals like dolphins are naturally adapted to travel quickly through water. • An aesthetic style mark, and a symbol of twentieth-century machine-age speed, precision, and efficiency and draw features embodied in all travel and transportation machines • Products looked up-to-date with clean and simplified silhouettes, sculptural casings and gleaming industrial materials • Streamlining covered up all the cogs and gears, and presented an image of sleekness and cleanliness. So you could say that streamlined styling romanticised technology, it helped to make it glamorous and user-friendly.

Post-modernism



- It embraces many different approaches to art making, and may be said to begin with pop art in the 1960s and to embrace much of what followed including conceptual art, neo-expressionism, feminist art, and the Young British Artists of the 1990s
- Post-modernism was born of scepticism and a suspicion of reason. It challenged the notion that there are universal certainties or truths.
- Post-modern art drew on philosophy of the mid to late twentieth century, and advocated that individual experience and interpretation of our experience was more concrete than abstract principles.
- Post-modernism embraced complex and often contradictory layers of meaning.

Part 3

Common materials, uses and properties - Polymers

Polymers:

Material	Thermoforming / thermosetting	Common uses	Material properties	Images
ABS				
PP				
HDPE				
LDPE				
Epoxy Resin				
Phenol Formaldehyde				
Melamine Formaldehyde				
PVC				
Nylon				
PMMA (Acrylic)				
UF				
Polyester Resin				

Common materials, uses and properties – Timbers

Timber based materials:

Material	Hardwood / softwood / manufactured board	Common uses	Material properties	Images
MDF				
Pine				
Chipboard				
Hardboard				
Mahogany				
Beech				
Oak				
Balsa				
Ash				
Birch				
Plywood				
Marine Ply				
Aeroply				
Teak				
Douglas Fir				
Spruce				
Redwood				
Cedar				
Larch				

Common materials, uses and properties – Metals

Metals:

Material	Ferrous / Non-ferrous / Non-ferrous alloy / Ferrous Alloy	Common uses	Material properties Include metal 'make up' for alloys)	Images
Cast iron				
Tool steel				
Zinc				
Mild steel (low carbon steel)				
Tin				
Aluminium				
Bronze				
Brass				
Copper				
Gold				
Silver				
Titanium				
Duralium				
Nitinol				

Common materials, uses and properties – Papers & Boards

Papers & Boards:

Material	Hardwood / softwood / manufactured board	Common uses	Material properties	Images
Duplex board				
Fluted PP sheet				
Cellulose acetate				
Corrugated card				
Solid white board				
Cartridge paper				
Watercolour paper				
Bleedproof paper				
Tracing paper				
Layout paper				