GCSE DT Internal Exam Information

List of content covered in the assessments

GCSE DT – CORE CONTENT- ALL STUDENTS

Textbook – Edexcel GCSE (9-1) Design and Technology

Topic Title	Topic Content
1.1 The impact of new and emerging technologies **Textbook pages 3 - 10**	• **Industry –** unemployment, workforce skill set, demographic movement, science and technology parks. • **Enterprise –** privately owned businesses, crowd funding, government funding and not-for-profit. • **Sustainability –** sustainable, transportation costs, pollution, demand on natural resources and waste generated (reducing, reusing, recycling and recovering). • **People –** workforce, consumers, children, people with disabilities, wage levels, highly skills workforce, automation and apprenticeships. • **Culture –** culture, population movement within the EU and social segregation. • **Society –** changes in working hours and shift patterns, Internet of Things (IoT), remote working and video conference meetings. • **Environment –** pollution, waste disposal, materials separation, transportation of good around the world and packaging of goods. • **Production techniques and systems –** standardised design and components, Just-in-time (JIY), lean manufacturing, batch production, continuous production, one-off production and mass production.
1.2 Evaluating new and emerging technologies to inform design decisions **Textbook pages 11 – 14**	• **Critical evaluation –** manufacturing capabilities, budget constraints, the materials used, timescale, who the product is for, 3D printing a lower jaw and portable power source for mobile hardware. • **Consideration of contemporary and potential future scenarios –** natural disasters, medical advances, travel, global warming and communication. • **Ethical perspectives on new and emerging technologies –** ethically. • **Environmental perspectives on new and emerging technologies –** use of materials, carbon footprint, manufacture and transportation: energy usage and consumption and life-cycle analysis.
1.3 Energy: generation, storage and choosing appropriate sources **Textbook pages 15 – 18**	• **Sources, generation and storage of energy –** coal, oil, gas, biomass, biodiesel, tidal, wind, solar, hydroelectric, storage energy and power systems. • **Choosing appropriate energy sources for products and power systems –** portability of the power source, environmental impact, power output, circuit/system connections and cost.

1.4 Smart and composite materials, and technical textiles **Textbook pages 19 – 24**	• **Modern and smart materials –** shape-memory alloys (SMAs), nanomaterials, photochromic glass, reactive glass, piezoelectric materials, temperature-responsive polymers, e.g. poly N-isopropylacrylamide (PNIPAM) and conductive links. • **Composites –** concrete, plywood, fibre/carbon/glass, reinforced polymers and robotic materials. • **Technical textiles –** agrotextiles, construction textiles, geotextiles, domestic textiles, environmentally friendly textiles, protective textiles and sports textiles.
1.5 Mechanical devices used to produce movement **Textbook pages 25 – 32**	• **Types of movement –** oscillation, linear, rotary and reciprocation. • **Classification of levers –** levers (effort, fulcrum and load), mechanical advantage, velocity ratio, efficiency, linkages, bell crank, reverse motion linkage, cams, followers, pulleys and belts, v-belt, input and output speeds, cranks and slides, gear types, simple gear trains, compound gear trains, idler gear, revolutions per minute calculations, bevel gears, rack and pinion.
1.6 Electronic systems **Textbook pages 33 - 35**	• **Sensors -** light-dependent resistor and thermistor. • **Control devices and components –** single-throw switch, resistors and transistor. • **Outputs –** buzzer and light-emitting diodes.
1.7 Programmable components **Textbook pages 35 – 37**	• **How to use flow charts.** • **Inputs and decisions: switching outputs on or off.** • **How to process and respond to analogue inputs –** analogue. • **How to use simple routines to control outputs -** time delay, count and feedback loop.
1.8 Categorisation of ferrous and non-ferrous metals **Textbook pages 37 – 39**	• **Ferrous metals –** mild steel, stainless steel and cast iron. • **Non-ferrous metals –** aluminium, copper and brass. • **Properties –** ductility, malleability and hardness.
1.9 Papers and boards **Textbook pages 40 – 42**	• **Board –** folding boxboard, corrugated board and solid white board. • **Properties –** flexibility, printability and biodegradability.
1.10 Thermoforming and thermosetting polymers **Textbook pages 43 – 46**	• **Thermoforming polymers –** acrylic (PMMA: polymethyl methacrylate), high-impact polystyrene (HIPS) and biopol. • **Thermosetting polymers –** polyester resin ad urea formaldehyde. • **Properties of polymer –** insulator of heat, insulator of electricity and toughness.
1.11 The categorisation of fibres, and textiles	• **Natural fibres –** animal wool and plant cotton. • **Synthetic fibres –** polyester and acrylic.

Textbook pages 47 – 51	• **Woven textiles –** plain weave – calico and twill weave – denim. • **Non-woven textiles –** felted wool fabric and bonded fibres/webs. • **Knitted textiles –** warp-knitted fabric and weft-knitted fabric. • **Properties –** elasticity, resilience and durability.
1.12 Natural and manufactured timbers **Textbook pages 52 – 54**	• **Natural timbers: hardwoods –** oak, mahogany, beech and balsa. • **Natural timbers: softwood –** pine and cedar. • **Manufacture timbers –** plywood and medium density fibreboard (MDF). • **Properties –** hardness, toughness and durability.
1.13 All design and technological practice takes place within contexts which inform outcomes **Textbook pages 55 – 58**	• **Using material, components and processes to inform outcomes –** mechanical properties (strength, elasticity, plasticity, malleability, ductility, hardness, toughness, brittleness, durability, stability and stiffness). Physical properties (density, electrical conductivity, thermal conductivity, size, corrosion, aesthetics, optical, joining and magnetism. • **Advantages and disadvantages of materials, components and manufacturing processes -** elements that are analysed. • **Justifying materials, components and manufacturing processes –** prototypes.
1.14 Challenges that influence the processes of design and making **Textbook pages 58 – 61**	• **Respect for different social, ethnic and economic groups.** • **Environmental, social and economic issues relating to the design and manufacture of products –** The Fairtrade Foundation, carbon offsetting schemes, product disassembly and disposal of waste. • **Consideration of 'green designs' –** promoting green designs, recycling and reusing materials and products. • **Human capability.** • **Cost of materials.** • **Manufacturing capability.** • **Environmental impact –** life-cycle analysis.
1.15 Investigate and analyse the work of professionals and companies to inform design **Textbook pages 62 – 65**	• **Analysing a product to specification criteria –** form, function, user requirements, performance requirements, materials and components/systems, scale of production and cost, sustainability, aesthetics, marketability and consideration of innovation. • **The work of past and present designers and companies –** Alessi, Apple, Heatherwick Studio, Joe Casely-Hayford, Pixar, Raymond Loewy, Tesla, Inc. and Zaha Hadid.
1.16 Use of different design strategies	• **Collaboration –** substitute, combine, adapt, modify, put, eliminate and reverse. • **User-centred design –** anthropometric data.

Textbook pages 66 – 68	• **Systems thinking,**
1.17 Using communication techniques to present design ideas **Textbook pages 68 – 77**	• **Freehand sketching –** different mediums, grid paper or templates and the use of arrows. • **Digital photography/media.** • **Cut and paste techniques.** • **3D models –** traditional materials, small plastic building bricks, system modelling and computer modelling. • **3D drawing.** • **Oblique and isometric projections.** • **Perspective drawing –** one-point perspective and two-point perspective. • **Orthographic and exploded views.** • **Assembly drawings.** • **Systems and schematic diagrams.** • **Computer-aided design and specialist drawing programs –** CAD freehand sketching, 2D modelling, 3D modelling and system design. • **Record and justify design ideas clearly –** annotated sketches.

GCSE DT - METAL STUDENTS ONLY

Topic Title	Topic Content
2.1 Design Contexts **Textbook page 87**	• **Design contexts**
2.2 Metals sources, properties, social and ecological footprints **Textbook pages 87 - 90**	• **Ferrous metals –** high carbon steel and tungsten steel. • **Non-ferrous metals –** tin, 7000 series aluminium alloys and titanium. • **Sources and origins –** iron, steel, aluminium, copper and tin. • **The physical characteristic of ferrous and non-ferrous metals –** conductivity, magnetism and density. • **Working properties of ferrous and non-ferrous metals –** durability, toughness, elasticity, strength, tensile and compressive. • **Social footprint –** trend forecasting, impact of extraction and material production on communities and wildlife, recycling and disposal, ecological footprint (sustainability, extraction and erosion of the landscape, processing, transportation, wastage and pollution).

2.3 The way in which the selection of metals is influenced **Textbook pages 90 - -92**	• **Factors that influence the selection of metals for a specific application –** aesthetic, environmental, availability, cost, social, cultural and ethical.
2.4 The impact of forces and stresses on metals and how they can be reinforced and stiffened **Textbook pages 92 - 94**	• **Forces and stresses –** compression, tension, shear, electrical and magnetic. • **Reinforcement/stiffening techniques –** hardening, tempering, the effect of carbon content and work hardening. • **I, U, T and C beams.**
2.5 Stock forms, types and sizes to calculate and determine the quantity of metals required **Textbook pages 95 - 97**	• **Stock forms/types –** bar, sheet, plate, pipe/tube, castings, extrusions, wire and powder metallurgy. • **Sizes –** gauge, cross-sectional area, diameter and wall thickness of tubes.
2.6 alternative processes that can be used to manufacture metal products to different scales of production **Textbook pages 98 - 107**	• **Processes –** forging, casting (sand casting, die casting, powder metallurgy – sintering), stamping, extrusion, welding, hardening (tempering, work hardening and annealing) and case hardening. • **Scales of production –** one-off, batch, mass, continuous, techniques for high-volume production, marking-out methods (scriber, odd leg calipers, engineer' square, centre punch, dividers, surface block and vee block. • **Ensuring quality when producing in quantity –** jigs, fixtures, templates, patterns, moulds, sub-assembly, computer-aided manufacture (CAM), quality control, working within tolerance and minimising waste.
2,7 Specialist techniques, tools, equipment and processes that can be used to shape, fabricate, construct and assemble a high-quality metal prototype **Textbook pages 107 - 120**	• **Tools and equipment –** hand tools, machinery and digital design and manufacture. • **Shaping –** filing, cutting, drilling, turning, milling, bending (beaten metalwork, sheet metalwork, tube bending). • **Abrading/grinding –** wet and dry paper, emery cloth and disc/angle grinder. • **Fabricating/constructing –** brazing, soldering (hard), punching, riveting: snap and pop, wastage and addition. • **Assembling –** tapping/threading, tapping and threading. • **Fastening –** nuts, bolts, washers and machine screws. • **Use of adhesives –** contact adhesive and epoxy resin.

2.8 Appropriate surface treatments and finishes that can be applied to metals for functional and aesthetic purposes **Textbook pages 121 - 123**	• **Surface finishes and treatments –** paint, dip coating, electroplating, anodising, galvanising, powder coating, lacquering and polishing.

GCSE DT - TIMBER STUDENTS ONLY

Topic Title	Topic Content
7.1 Design Contexts **Textbook page 277**	• **Design contexts.**
7.2 Sources of timber **Textbook pages 277 - 283**	• **Natural timbers: hardwoods –** oak, mahogany, beech, balsa, jelutong, birch and ash. • **Natural timbers: softwoods –** larch. • **Manufactured timber –** plywood, MDF and chipboard. • **Sources and origins of timber.** • **The physical characteristics of timber –** knots, colour, grain structure and density. • **Working properties –** elasticity, tensile strength and compressive strength. • **Social footprint –** trend forecasting, impact of logging on communities, recycling and disposal. • **Ecological footprint –** sustainability, deforestation, habitat destruction and loss, processing, transportation, wastage and pollution.
7.3 Selection of timber **Textbook pages 283 - 287**	• **Aesthetics factors –** form, colour and texture. • **Environmental factors –** sustainability, genetic engineering, seasoning and upcycling. • **Availability factors –** use of stock materials, use of specialist materials, hurricanes, storms and disease. • **Cost factors –** quality of material, manufacturing processes necessary and treatments. • **Social factors –** use for different social groups, trends, fashion and popularity. • **Cultural and ethical factors –** avoiding offence, suitability for intended market, the consumer society, the effects of mass production and built-in product obsolescence.
7.4 Strengthening timber	• **Forces and stresses –** compression, tension and shear. • **Natural forces within the timber as it grows.**

Textbook pages 288 - 289	• **Pre-stressed construction beams.** • **Reinforcement and stiffening techniques –** frame structures, fabrication, assembly and construction processes. • **Lamination.** • **Braces and tie bars.** • **Embedding composite materials.**
7.5 Stock forms and sizes **Textbook pages 290 - 291**	• **Srock forms/types –** regular sections, mouldings, dowels and sheets. • **Sizes –** imperial and metric, PAR and PSE, cross-sectioned area, diameter and board sizes.
7.6 Manufacturing processes **Textbook pages 292 - 296**	• **Processes to cut and shape materials –** routing, sawing, use of mortiser and use of a bag press. • **Scales of production –** one-off, batch, mass production and continuous. • **Techniques for quantity production –** marking-out methods, jigs, fixtures, templates, patterns, sub-assembly, computer-aided manufacturing, quality control, working within tolerance and efficient cutting to minimise waste.
7.7 Equipment and processes used to make prototypes **Textbook pages 296 - 304**	• **Tools and equipment –** hand tools, machinery, digital design and manufacture. • **Shaping –** drilling (twist drill, flat bit, forstner bit, auger and hole saw). • **Cutting –** hand saw, tenon saw, coping saw, scroll saw and jigsaw. • **Planing.** • **Chiselling.** • **Turning.** • **Abrading.** • **Carving.** • **Files, rasps and surforms.** • **Fabricating and constructing –** lamination, veneering, use of screws, nailing (round wire nails, oval nails and panel pins), adhesives (PVA, contact adhesive) and wood joints (butt, dowel, lap, housing, mitre, dovetail, mortise and tenon). • **Wastage.** • **Addition.** • **Assembling –** knock-down fittings and ironmongery. • **Hinges –** butt, flush, butterfly and T hinge.
7.8 Surface treatments and finishes for functional and aesthetic purposes	• **Surface finishes and treatments –** painting, staining, varnishing, wax, oil, shellac and veneering.

Textbook pages 304 - 305	

Any resources which students can use to support this preparation for the assessments

- Access to the ActiveLearn online course textbook.
- A subject reference guide – this provides students with information about the different areas of study.
- Workbooks that they will bring home prior to exams, which includes practice questions and video links.
- A subject knowledge organiser – a quick reference guide.
- DTtoolbox channel on YouTube is good (DT teacher's channel)
- Design and Technology on Demand channel (although AQA is covered the topics are the same as Pearson Edexcel)
- https://wiki.dtonline.org/index.php/Main_Page is good if there is a specific term they want to look up.