

OCL D&T: Long Term Plan KS4 (Pearson GCSE D&T)

Pearson Edexcel GCSE Design and Technology (9-1) from 2017: [https://qualifications.pearson.com/content/dam/pdf/GCSE/design-and-technology/2017/specification-and-sample-assessments/Pearson Edexcel GCSE 9 to 1 in Design and Technology Specification issue3.pdf](https://qualifications.pearson.com/content/dam/pdf/GCSE/design-and-technology/2017/specification-and-sample-assessments/Pearson_Edexcel_GCSE_9_to_1_in_Design_and_Technology_Specification_issue3.pdf)

Brief overview of Year 10

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In Year 10						
Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Unit title	CAD & 3D printing	Systems Thinking 1: mechanical	Systems Thinking 2: electronic	Prototyping & structures	Core: Materials & manufacturing methods	Specialist area: Polymers & manufacturing
	6 weeks / 18 lessons	6 weeks / 18 lessons	6 weeks / 18 lessons	6 weeks / 18 lessons	6 weeks / 18 lessons	6 weeks / 18 lessons
Relevant core concepts (design, make, design & make, wider consequences of D&T, technical knowledge, materials, responsibility, vocabulary)	Designing, Making, Technical knowledge, Vocabulary <i>This unit primarily develops technical knowledge and making skills through hands-on CAD and 3D printing practice, with vocabulary built through annotation and process justification.</i>	Technical knowledge, Vocabulary <i>This unit is primarily technical knowledge, with vocabulary developed through precise use of mechanism terminology in written and spoken explanation.</i>	Designing, Making, Technical knowledge, Vocabulary <i>This unit continues the systems thinking thread, shifting from mechanical to electronic and programmable systems — vocabulary develops through component naming, circuit annotation and flowchart construction.</i>	Designing, Making, Designing + making, Technical knowledge <i>This unit draws together designing and making strands in an integrated way, with technical knowledge of structures and forces underpinning practical prototyping activity.</i>	Materials, Wider consequences of D&T, Responsibility, Vocabulary <i>This unit is primarily materials-focused, with responsibility and wider consequences woven in through sustainability and LCA content, and vocabulary built through comparative written justification tasks.</i>	Materials, Technical knowledge, Responsibility, Vocabulary <i>This unit deepens the materials strand into specialist territory, with responsibility threaded through sustainability and end-of-life considerations, and vocabulary precision increasingly important as students prepare for Section B exam questions.</i>

End points	Students can use CAD software to design and modify 3D objects and understand FDM 3D printing as a manufacturing process — including its advantages, limitations and material considerations. This unit establishes the digital making foundation for NEA prototype work; students are not yet expected to work fully independently but should be able to justify basic process and material choices by the end of the unit.	Students can identify, describe and calculate the behaviour of mechanical systems — selecting and justifying appropriate mechanisms for a given design problem. This unit delivers the majority of the calculation-heavy content that carries marks in Section A of the written exam; fluency with MA, VR and RPM needs to be established here and revisited regularly.	Students can describe the function of electronic components within a system, construct simple circuits, and use programmable components to control outputs in response to inputs. This unit completes the technical knowledge picture alongside mechanisms and feeds directly into NEA product development where electronic or programmable elements are incorporated.	Students can select and use appropriate prototyping techniques to develop and test ideas, and understand how structures are designed to withstand forces. This unit bridges taught content and NEA practice — students should leave it with the making habits and quality control instincts that the NEA Make component directly rewards.	Students can compare and justify material choices across all core categories, with reference to working properties, sustainability, cost and fitness for purpose. This unit builds the breadth of material knowledge assessed in Section A of the written exam and provides the comparative framework students need to justify NEA material selections.	Students have secure depth of knowledge of polymer types, properties and manufacturing processes — and can apply this to justify material and process choices in both NEA and exam contexts. Section B of the written exam (60 marks) is the single largest source of marks in the qualification; the depth of specialist knowledge built here is the foundation everything in Year 11 builds on.
Core declarative knowledge <i>facts or information stored in the memory</i>	Students need to: > Know that CAD tools including mirror, group, align and boolean operations can be used to create and modify 3D objects > Know that FDM 3D printing builds objects layer by layer using filament, with infill and supports affecting	Students need to: > Know that there are four types of movement: linear, reciprocating, rotary and oscillating > Know that levers are classified as class 1, 2 or 3 and that MA and VR can be calculated from load, effort and distance	Students need to: > Know that sensors including LDRs and thermistors detect changes in the environment and feed data into a system > Know that transistors, resistors and switches act as control devices	Students need to: > Know that structures can be classified as frame, shell or mass > Know that compression, tension, shear and torsion are forces that act on structures	Students need to: > Know that ferrous metals contain iron and are generally magnetic; non-ferrous metals do not > Know that papers and boards vary in weight, surface finish, printability and biodegradability	Students need to: > Know that thermoforming polymers including acrylic, HIPS, ABS, PET and PVC can be reshaped with heat and are suited to different applications > Know that thermosetting polymers including

strength and print time > Know that PLA and ABS have different properties and suit different applications > Know that additive manufacturing differs from subtractive manufacturing in material use and waste > Know that the design → slice → print workflow connects digital design to physical output > Know that CAD tools including mirror, group, align and boolean operations can be used to create and modify 3D objects > Know that FDM 3D printing builds objects layer by layer using filament, with infill and supports affecting strength and print time > Know that PLA and ABS have different properties and suit different applications > Know that additive manufacturing differs from subtractive	> Know that bell crank and reverse motion linkages change the direction of movement > Know that cams (pear, eccentric, drop) convert rotary to reciprocating motion via a follower > Know that pulleys and belts transmit motion and that VR depends on pulley diameter > Know that cranks and sliders convert rotary to linear motion > Know that gear trains, bevel gears and rack and pinion systems transmit and modify rotary motion, and that RPM can be calculated from gear ratios	within electronic systems > Know that LEDs and buzzers are common output devices > Know that electronic systems can be modelled as input → process → output → feedback > Know that programmable components can be controlled using flowcharts, and can respond to analogue inputs using loops, delays and counts	> Know that reinforcement and stiffening techniques can be used to resist forces > Know that prototyping is a key part of an iterative design process > Know that quality control involves checking dimensions against tolerances to ensure accuracy	> Know that thermoforming polymers can be reshaped with heat; thermosetting polymers cannot > Know that natural and synthetic textiles differ in origin, properties and environmental impact > Know that hardwoods and softwoods differ in structure, properties and typical applications, and that manufactured boards offer consistency and reduced waste > Know that modern and smart materials including SMAs, nanomaterials, piezoelectric materials and conductive inks have specialist properties and emerging applications > Know that composites combine two or more materials to achieve properties neither could alone > Know that manufacturing scale (one-off, batch, mass, continuous) affects	polyester resin and urea formaldehyde cannot be reshaped once set > Know that vacuum forming, line bending, injection moulding and blow moulding are key polymer manufacturing processes with different applications and scales of production > Know that surface finishing techniques including polishing, painting and dip coating affect both aesthetics and function > Know that polymer production and disposal have significant social and ecological consequences, and that biodegradable alternatives such as Biopol are in development
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	manufacturing in material use and waste > Know that the design → slice → print workflow connects digital design to physical output				cost, consistency and waste > Know that JIT and lean manufacturing aim to reduce waste and increase efficiency	
Core procedural knowledge <i>the knowledge exercised in the performance of a task</i>	Students need to be able to: > Be able to create and modify a 3D model in CAD > Be able to prepare a file for printing using slicing software > Be able to evaluate a printed outcome against design intent > Be able to annotate CAD work to communicate design decisions	Students need to: > Be able to calculate MA, VR and RPM for given mechanisms > Be able to draw and label a mechanism diagram showing input, process and output > Be able to select and justify an appropriate mechanism for a design context > Be able to model or construct a working mechanical system	Students need to: > Be able to build and test a simple electronic circuit > Be able to create a flowchart to control a programmable output > Be able to identify and explain the role of each component in a given system > Be able to identify and correct faults in a simple circuit	Students need to: > Be able to build and test a structural prototype against defined criteria > Be able to select and justify prototyping materials and techniques for a given context > Be able to apply quality control checks at key stages of making > Be able to iterate a design in response to testing outcomes and record modifications	Students need to: > Be able to compare materials across categories using defined criteria (properties, cost, sustainability) > Be able to justify material selection for a given design context in writing > Be able to identify the most appropriate manufacturing method for a given scale of production > Be able to apply LCA thinking to evaluate a material or product across its lifecycle	Students need to: > Be able to select and justify a polymer for a specific design application with reference to properties, cost and sustainability > Be able to plan and carry out a polymer manufacturing process such as vacuum forming or line bending > Be able to apply an appropriate surface finish to a polymer component > Be able to write a justified material selection for an NEA design proposal

Hinterland knowledge <i>the extra contextual knowledge needed to be able to understand key concepts or vocabulary</i>	> Industrial and medical applications of additive manufacturing > The open-source and maker movement > How 3D printing is disrupting traditional supply chains	> Be able to calculate MA, VR and RPM for given mechanisms > Be able to draw and label a mechanism diagram showing input, process and output > Be able to select and justify an appropriate mechanism for a design context > Be able to model or construct a working mechanical system	> Internet of Things (IoT) and smart products in everyday life > How embedded electronics have transformed product design > Links to Physics and Computing curricula	> Structural engineering in architecture and product design > How failure testing informs real-world engineering (bridges, aircraft) > Links to Physics: forces and materials	> Global supply chains and the geography of raw material extraction > The environmental cost of material production and processing > Technical textiles and emerging material innovations	> History of plastics and their cultural impact on 20th century design > The global plastics crisis and emerging biodegradable alternatives > Polymer recycling systems and their limitations
Assessment opportunities (formative and summative)	> Formative: peer review of CAD models; teacher questioning on process choices > Summative: evaluated 3D printed prototype with annotated CAD output	> Formative: timed calculation practice; mechanism diagram labelling > Summative: exam-style question set on mechanisms; annotated working model	> Formative: circuit-building tasks; flowchart design challenges > Summative: systems diagram with component justification; exam-style question set	> Formative: structure testing challenges with recorded results; peer critique > Summative: iterative prototype with evaluation against design criteria	> Formative: material comparison card sorts; timed written justification tasks > Summative: extended written response — material selection and justification for a given brief	> Formative: process selection tasks; written justification practice against exam-style prompts > Summative: Section B style extended response; evaluated polymer prototype

Brief overview of Year 11

In Year 11

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Unit title	NEA 1	NEA 2	NEA 3	NEA ("mop-up" if required) Exam preparation 1	Exam preparation 2	Exam preparation 3 / study leave
	6 weeks / 18 lessons	6 weeks / 18 lessons	6 weeks / 18 lessons	6 weeks / 18 lessons	6 weeks / 18 lessons	6 weeks / 18 lessons
Relevant core concepts (design, make, design & make, wider consequences of D&T, technical knowledge, materials, responsibility, vocabulary)	Designing, Making, Designing + making, Responsibility, Vocabulary <i>This unit launches the NEA, with designing and investigating strands dominant — students begin applying the full range of design thinking tools and communication techniques in response to the contextual challenge released in June.</i>	Designing, Making, Designing + making, Vocabulary <i>Design and making strands are both active here — students develop and refine their chosen design through modelling and iteration, moving into early making by the end of the unit.</i>	Making, Designing + making, Responsibility, Vocabulary <i>Making is the dominant strand here, with responsibility active through material justification and quality control, and vocabulary precision expected in portfolio annotation.</i>	Designing, Making, Designing + making, Wider consequences of D&T, Technical knowledge, Vocabulary <i>This unit is deliberately dual-purpose — NEA completion strands are finalised while exam preparation begins, with wider consequences and technical knowledge strands re-entering through structured revision.</i>	Wider consequences of D&T, Technical knowledge, Materials, Responsibility, Vocabulary <i>All knowledge strands are active in exam preparation — this unit consolidates and applies content across the full specification, with particular focus on the areas most frequently examined and most frequently underprepared.</i>	Wider consequences of D&T, Technical knowledge, Materials, Responsibility, Vocabulary <i>All strands are consolidated here — the focus shifts to independent retrieval practice, identification of personal knowledge gaps, and exam technique refinement.</i>

End points	Designing, Making, Designing + making, Responsibility, Vocabulary <i>This unit launches the NEA, with designing and investigating strands dominant — students begin applying the full range of design thinking tools and communication techniques in response to the contextual challenge released in June.</i>	Students have completed or substantially completed the Design section and begun the Make section of the NEA portfolio. Students should have a fully developed, clearly communicated and justified design solution with visible evidence of iteration before making begins in earnest.	Students have completed or are close to completing the Make section (36 marks) of the NEA portfolio, with photographic process evidence and quality control records in place. Making is the primary practical focus of this unit; portfolios must contain evidence of process as well as outcome.	Students have submitted a complete, coherent NEA portfolio across all four sections and begun structured exam preparation. The Evaluate section (6 marks), though small, is frequently underdeveloped — concise, evidence-based evaluation directly referencing specification criteria should be secured before submission.	Students can attempt all question types across Section A and Section B with confidence, including extended open-response questions, calculation questions and unseen product analysis tasks. The written exam is 50% of the qualification; targeted, structured revision in this unit directly determines outcomes.	Students are fully prepared for the written examination, able to deploy knowledge confidently across all topic areas and respond accurately to all command word types. This is the final preparation window; the priority is consolidation and confidence, not new content.
Core declarative knowledge <i>facts or information stored in the memory</i>	Students need to: >Know that the NEA contextual challenge requires investigation of user needs, primary and secondary research, and a justified design specification >Know that a design specification should contain measurable, testable criteria referenced to user needs and sustainability >Know that empathy mapping, user personas and	>Know that design development requires modelling, testing and refinement — not linear progression from idea to final design >Know that final design communication should use appropriate 2D and 3D techniques including orthographic projection, isometric drawing, exploded views and CAD >Know that all major design decisions should be justified with explicit reference to the design specification >Know that a production plan or	Know that the Make section is assessed on quality, accuracy and finish — and that both photographic process evidence and the teacher quality and accuracy grid contribute to the mark Know that quality control involves checking dimensions against tolerances at key stages, not just at the end	Know that the Evaluate section requires testing against measurable specification criteria, honest recording of results and specific, justified suggestions for improvement Know that Section A of the written exam (40 marks) assesses core content including mechanisms calculations, energy, emerging technologies, sustainability and designer study	Know that Section A includes heavy marks of calculation questions — MA, VR, RPM and energy calculations must be practised under timed conditions Know that designer study and product analysis using ACCESSFM criteria are consistently examined in Section A Know that Section B assesses depth of specialist material knowledge — processes, properties,	Know that underlining the command word before beginning any written response reduces misreading and mark loss Know that extended open-response answers should be structured as multi-point responses with each point developed and, where relevant, evidenced Know that calculation answers require working shown, correct formula applied and

	contextual research are UCD tools used to investigate a design context Know that initial design ideas should demonstrate range, avoid design fixation and be communicated using multiple techniques	Gantt chart should be prepared before making begins, identifying key stages, tools, materials and time allocations	Know that modifications made during making should be recorded with reasons as evidence of responsive, reflective practice Know that material and process choices made during making should be justifiable with reference to working properties, cost and sustainability	Know that extended open-response questions carry the most marks in both Section A and Section B and require structured, multi-point answers Know that Pearson command words (identify, describe, explain, analyse, evaluate, justify, calculate) each require a different type of response	joining, finishing and justified selection Know that responsibility-related content including LCA, circular economy, fair trade and planned obsolescence appears consistently in Section A extended questions	appropriate units included Know that comparison questions require explicit identification of both similarities and differences with reference to named criteria
Core procedural knowledge <i>the knowledge exercised in the performance of a task</i>	Students need to: >Be able to analyse a contextual challenge and identify relevant user needs > Be able to carry out and record primary and secondary research selectively and purposefully > Be able to write a justified, measurable design specification >Be able to generate a range of initial design ideas using freehand, annotated and CAD techniques	Be able to develop a chosen design through modelling and iteration, recording changes and reasons Be able to communicate a final design clearly using appropriate 2D and 3D techniques and CAD Be able to justify design decisions with explicit reference to the specification and user needs Be able to produce a production plan identifying key stages, tools, materials and timings	Be able to manufacture a final prototype to a high standard of quality and accuracy, working safely and independently Be able to apply quality control checks throughout the making process, recording results as portfolio evidence Be able to respond pragmatically to problems during making, adapting	Be able to write a concise, evidence-based evaluation that directly references specification criteria and testing outcomes Be able to complete internal standardisation and moderation checks before NEA submission Be able to attempt timed exam-style questions across core content areas Be able to identify the command word	Be able to answer calculation questions showing working and including correct units Be able to analyse an unseen product using ACCESSFM or equivalent framework in timed conditions Be able to write structured, multi-point extended responses on topics including sustainability, emerging technologies and global manufacturing	Be able to complete a full past paper under timed exam conditions independently Be able to self-assess responses against mark schemes and identify personal knowledge gaps Be able to write fluent, structured extended responses across all major topic areas Be able to apply specialist polymer knowledge confidently to unseen

			plans and recording modifications Be able to demonstrate skill in the use of tools and processes appropriate to the chosen material specialism	in an exam question and structure a response accordingly	Be able to answer Section B questions with depth and precision on specialist polymer knowledge	exam contexts in Section B
Hinterland knowledge <i>the extra contextual knowledge needed to be able to understand key concepts or vocabulary</i>	Real-world design briefs and how professional designers respond to client and user needs How iterative design processes work in industry (e.g. double diamond, agile design) Examples of strong and weak NEA portfolios — what distinguishes levels	How professional designers document and communicate design decisions The role of modelling and prototyping in reducing risk before manufacture How annotation quality distinguishes performance levels in examined portfolios	How quality control operates in industrial manufacturing contexts The relationship between planning, precision and product quality in professional making How photographic documentation is used in design and engineering industries	How external moderation works and what moderators look for in a portfolio The relationship between specification criteria, testing and honest evaluation in professional design practice How past paper analysis can reveal which topics recur most frequently	How exam boards construct mark schemes and what examiners are looking for The value of past paper analysis in identifying high-frequency topics How to use Pearson examWizard to generate targeted topic practice	Revision strategies supported by cognitive science (retrieval practice, spaced practice, interleaving) How to manage exam conditions, timing and question selection effectively The relationship between vocabulary precision and marks awarded in extended responses

Assessment opportunities (formative and summative)	Formative: teacher review of research depth and specification quality against NEA criteria grids; peer critique of initial ideas Summative: completed Investigate section assessed against NEA mark scheme (16 marks)	Formative: teacher audit of portfolio against NEA Design criteria grids; annotation quality review Summative: Design section assessed against NEA mark scheme	Formative: teacher review of making progress against production plan; quality and accuracy grid checks at key stages Summative: Make section assessed against NEA mark scheme (36 marks); teacher quality and accuracy grid completed	Formative: mock evaluation tasks marked against NEA criteria; timed exam question practice with feedback Summative: completed NEA portfolio submitted for internal standardisation; Section A timed practice paper	Formative: timed past paper sections with examiner-style feedback; calculation practice with worked examples Summative: full mock paper under exam conditions; Section B extended response marked against mark scheme	Formative: self-assessed past paper practice; retrieval quizzes on high-frequency topics Summative: final examination under full exam conditions
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