

Year 10 Engineering Design Curriculum End Points and Key Vocabulary

	Autumn Term 1	Autumn Term 2	Spring Term 1	Spring Term 2	Summer Term 1	Summer Term 2
Units of Work	R038: Principles of Engineering Design - Designing Processes, Stages & Strategies, Cyclic Approach; Introduction to Sketching & CAD	R038: Sketching & CAD Development & R039: Communicating Designs (Sketching Design Ideas Activity)	R038: Advanced Sketching & CAD & R039: Drawing Design Ideas & NEA R039 Assessment	R038: CAD Drawing & R039: Producing CAD Models Activity & NEA R039 Assessment	R038: Influences on Engineering Product Design & NEA R039 Assessment	R038: Make, Model & Evaluate (Virtual/Physical Prototypes) & NEA R039 Assessment (Submit for Moderation)
Ethos Links	<p>Sustainability: Consideration of sustainable design strategies, life-cycle awareness, and eco-friendly product development.</p> <p>STEM: Application of iterative design principles, mathematical proportions, and analytical thinking in engineering.</p> <p>Milton Keynes: Investigating local engineering design firms and product development enterprises in Milton Keynes.</p>	<p>Sustainability: Factoring sustainable material choices and environmental impact into initial design sketches.</p> <p>STEM: Proportional representation, orthographic projection rules, and geometric construction in CAD.</p> <p>Milton Keynes: Analysing local consumer products and engineering solutions used across Milton Keynes infrastructure.</p>	<p>Sustainability: Evaluating how design ideas address environmental criteria and material efficiency.</p> <p>STEM: Precision measurement, scaling, and conversion between metric units and drawing dimensions.</p> <p>Milton Keynes: Applying drawing standards to practical engineering scenarios relevant to Milton Keynes industries.</p>	<p>Sustainability: Using virtual modelling to minimise physical material waste and prototype iterations.</p> <p>STEM: Application of 3D CAD features (extrusions, revolves, shelling, work planes) and mathematical modelling.</p> <p>Milton Keynes: Exploring CAD-based prototyping workflows used in regional manufacturing sectors.</p>	<p>Sustainability: Detailed study of the 6Rs (Rethink, Reuse, Repair, Refuse, Reduce, Recycle), circular economy, and planned obsolescence.</p> <p>STEM: Analysis of market pull vs. technology push, lifecycle energy consumption, and regulatory standards.</p> <p>Milton Keynes: Investigating environmental sustainability policies and green technology initiatives in Milton Keynes.</p>	<p>Sustainability: Assessing eco-friendly manufacturing methods and comparing virtual vs. physical resource consumption.</p> <p>STEM: Dimensional accuracy, tolerance checking, and physical testing of prototype functionality.</p> <p>Milton Keynes: Preparing coursework portfolios for internal standardisation and external moderation.</p>
Learning End Points	By the end of this unit students will know and understand:	By the end of this unit students will know and understand: • Primary and	By the end of this unit students will know and understand: • Requirements for	By the end of this unit students will know and understand: • Advanced CAD sketch	By the end of this unit students will know and understand: • Market pull and	By the end of this unit students will know and understand:

	<ul style="list-style-type: none"> • The stages involved in design strategies (linear, iterative, inclusive, user-centred, sustainable, ergonomic). • The cyclic approach and key stages of the iterative design process (design, make, evaluate). • Fundamentals of freehand sketching, 2D/3D drawing, and computer-aided design (CAD). 	<p>secondary research methods (surveys, interviews, focus groups, literature searches).</p> <ul style="list-style-type: none"> • Product analysis techniques using ACCESS FM (Aesthetics, Cost, Customer, Environment, Size, Safety, Function, Materials, Manufacturing). • Principles of manual freehand sketching, isometric projection, and rendering with thick/thin lines and tone. 	<p>generating creative and innovative design proposals responding to a design specification.</p> <ul style="list-style-type: none"> • Detailed annotation and labelling techniques to describe function, features, and material choices. • Structure and task requirements of R039 Unit set assignment (Communicating Designs). 	<p>tool features (lines, arcs, polygons, dimensions, constraints).</p> <ul style="list-style-type: none"> • 3D solid modelling techniques including extrudes, revolves, holes, fillets, and assembly mate tools. • Rendering and animation features within CAD software to present design proposals. 	<p>technology push drivers in engineering innovation.</p> <ul style="list-style-type: none"> • Sustainability principles: the 6Rs, circular economy design, and planned obsolescence. • Quality and regulatory standards: British Standards (BS), UKCA marking, and health & safety legislation. 	<ul style="list-style-type: none"> • Reasons for virtual and physical modelling (testing proportions, scale, function, and ergonomics). • Methods of evaluating design outcomes against design briefs and specifications. • Administrative procedures for R039 final mark submission and portfolio uploading via Submit for Assessment.
	<p>By the end of this unit students will develop their ability to:</p> <ul style="list-style-type: none"> • Recommend and justify appropriate design strategies for specific engineering products. • Apply basic freehand sketching techniques and 2D/3D visualisation to communicate initial engineering concepts. • Navigate CAD software interfaces to set up basic geometric features. 	<p>By the end of this unit students will develop their ability to:</p> <ul style="list-style-type: none"> • Conduct primary and secondary research to inform engineering design ideas. • Perform ACCESS FM product analysis on existing engineering artifacts. • Produce rendered freehand sketches incorporating 2D/3D views, shading, and technical annotations. 	<p>By the end of this unit students will develop their ability to:</p> <ul style="list-style-type: none"> • Generate a wide range of creative freehand design proposals directly addressing specification criteria. • Produce detailed annotations explaining key design features, mechanisms, and assembly methods. • Initiate and progress work independently toward the R039 NEA assessment portfolio. 	<p>By the end of this unit students will develop their ability to:</p> <ul style="list-style-type: none"> • Construct complex 3D CAD models and multi-component assemblies using mate constraints. • Apply realistic material rendering and visual presentation techniques in CAD software. • Consolidate digital evidence files for R039 coursework submission. 	<p>By the end of this unit students will develop their ability to:</p> <ul style="list-style-type: none"> • Analyse how external influences and legislation impact engineering product design. • Evaluate products against sustainability metrics and the 6Rs framework. • Refine and finalise all R039 NEA evidence in preparation for moderation submission. 	<p>By the end of this unit students will develop their ability to:</p> <ul style="list-style-type: none"> • Fabricate physical models and execute virtual CAD simulations to test engineering concepts. • Compare prototype performance quantitatively and qualitatively against design specifications. • Complete final formatting and submit R039 NEA portfolios for moderation.
Key Vocabulary	Iterative design, User-centred design, Ergonomic design, Sustainable design,	Primary research, Secondary research, ACCESS FM, Isometric projection, Rendering,	Specification criteria, Design proposal, Function, Feature, Material choice,	Extrude, Revolve, Shell, Fillet, Mate constraint, Assembly, Rendering,	Market pull, Technology push, 6Rs, Circular economy, Planned obsolescence,	Virtual prototype, Physical prototype, Scale, Proportion, Ergonomics,

	Linear design, Freehand sketching, CAD, Cyclic approach, Design brief, Specification.	Tone, Texture, Annotation, Customer, Aesthetics.	Assembly method, Annotation, Innovation, Portfolio, Evidence.	Animation, Digital evidence, CAD model.	UKCA, British Standards, Legislation, Risk assessment, Moderation.	Quantitative evaluation, Qualitative evaluation, Submission, Moderation, URS.
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