



Key Stage 4 Curriculum Journey: Year 10 Engineering

The curriculum in Engineering equips learners with the knowledge to understand the processes of engineering including design, analysis, prototype development and evaluation, and the role that engineering plays in the world. The subject is designed to inspire students to be innovative, creative and apply their knowledge in a way which is transferable to, and draws on different real-life contexts such as design, mechanical and quality control engineering. Students are encouraged to move from theory to practice and to bring their ideas into reality by developing solutions to technical issues

THE YEAR 10 CURRICULUM JOURNEY

	HALF TERM 1	HALF TERM 2	HALF TERM 3	HALF TERM 4	HALF TERM 5	HALF TERM 6
Topic and learning focus	<p>Students are introduced to the basic principles of design and design process.</p> <p>Students then apply their understanding and knowledge of the design process to both original and existing products.</p>		<p>Students develop their drawing skills, learning the conventions and expectations of formal engineering drawings and how to use Fusion360 to produce simple CAD drawings of an original product.</p>		<p>Analysis of existing products and beginning R040 coursework (tasks 1 and 3).</p> <p>Manufacturing and machining techniques and creation of CAD models.</p> <p>Gantt charts and their use in planning engineering processes.</p>	
Foundational Knowledge Prior learning needed	<ul style="list-style-type: none"> • An understanding of the simple steps involved in the iterative design process. • Simple techniques for sketching including perspective and shading. • The learning in this block of work primarily builds upon learning from KS3 DT. • Recognise the imperative to sell products for profit in a market economy. • Understanding that CAD software is an essential tool in modern engineering. 		<ul style="list-style-type: none"> • Using Fusion 360 to draw and manipulate geometrical shapes in 3D. • Different types of engineering drawing (e.g. orthographic and circuit diagrams) 		<ul style="list-style-type: none"> • Knowledge of some manufacturing techniques and the scales of manufacture. • Key features of 3rd angle orthographic drawings. • Using Fusion 360 to draw objects. • ACCESSFM 	
Core Knowledge and skills	<ul style="list-style-type: none"> • The four distinct stages in the design cycle – <i>identify, design, optimise and validate</i>. • The required content of a design brief and specification. 		<ul style="list-style-type: none"> • Key features of 3rd angle orthographic drawings and commonly used abbreviations/symbols. • Tolerance in diagrams • Features and details in wiring and circuit diagrams 		<ul style="list-style-type: none"> • Using ACCESSFM to analyse existing products. • More complex manufacturing processes such as casting. • Creating CAD models from orthographic drawings. 	

	<ul style="list-style-type: none"> Using ACCESSFM to analyse existing products and formulate design specifications. Techniques to develop and enhance sketches showing initial design ideas. Understand how to create simple models using Autodesk Fusion 360 CAD software. Understand how physical models might be made and why they are made. Understand the importance of sustainability in developing new products. Use a variety of tools to disassemble a product identifying the main components and suggesting how the components may have been manufactured. 	<ul style="list-style-type: none"> Use of ACCESSFM to analyse products. 	
Developmental Knowledge and Skills	<ul style="list-style-type: none"> Analyse existing products, evaluating the relative strengths and weaknesses of the products against others available in the market. Evaluate design briefs and specifications, planning and drafting both briefs and specifications for existing products. Interpreting design specifications and applying these do to original design ideas. Use more complex tools in Fusion 360 such as joints/assemblies and selections of material. 	<ul style="list-style-type: none"> Use Fusion 360 to produce exploded views, sectional views and animations. Justifying manufacturing and machining techniques and their use to a variety of situations. 	<ul style="list-style-type: none"> Produce detailed CAD models using different materials, views and animation techniques. Understand how Gantt charts can be a useful process planning tool and be able to break down the R040 manufacture with a Gantt chart.
Complex Knowledge	<ul style="list-style-type: none"> Explore example design briefs and specifications, theorising as to why points within those briefs/specifications may have been included or omitted. Be able to independently use Fusion 360 to create complex assemblies using a full range of tools. 	<ul style="list-style-type: none"> Understand how QFD can be used in project management. Be able to use simulations in Fusion 360. 	<ul style="list-style-type: none"> Create a QFD diagram for the R040 project independently. Produce a detailed and independent production plan Analyse in detail the probable manufacturing techniques used in the example products.
Links with the National Curriculum	KS3/4 DT use research and exploration, such as the study of different cultures, to identify and understand user needs identify and solve their own design problems and understand how to reformulate problems given to them	KS3/4 DT develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools use research and exploration, such as the study of different cultures, to identify and understand user needs identify and	KS3/4 DT select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture select from and use a wider, more complex range of materials, components and ingredients, taking into account their properties

	develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations	solve their own design problems and understand how to reformulate problems given to them develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations	
Literacy (including reading)	<ul style="list-style-type: none"> • Reading and summarising/interpreting points in a design specification • Summarising and paraphrasing complex ideas into key points. • Using specialised terminology 	<ul style="list-style-type: none"> • Formulating questions and analysing responses to/from surveys and focus groups considering clarity of questions. • Use of articles and engineering case studies (such as the construction of bridges and the Iphone) 	<ul style="list-style-type: none"> • Research and reading about new materials such as carbon fibre and graphene. • Use of technical language to describe the properties of these materials.
Cultural Capital	<ul style="list-style-type: none"> • An understanding of how everyday products are designed and made and how engineering decisions impact our lives. 	<ul style="list-style-type: none"> • Applications of engineering principles to structures and inventions throughout history (for example the construction of the pyramids and ancient structures) 	<ul style="list-style-type: none"> • An appreciation of the impact of scientific discoveries and how these impact the items we use. • An understanding of project management and how work and tasks can be organised.
Social, Moral, Spiritual and Cultural Development	<ul style="list-style-type: none"> • Discussion and teamwork with opportunity for lots of collaborative working. • Environmental impact of our manufacturing and design choices. The importance of careful use and selection of materials for minimal cost and environmental impact. The need to balance environmental impact against cost and economic factors. • An appreciation of the legal framework in which designers and companies are required to operate in including safe working and the development and testing of safe products. • Analysis of products, identifying strengths and weaknesses to ensure that the correct products are chosen for the appropriate tasks. • Mutual respect is fostered through collaborative working and sharing of ideas. 		
Fundamental British Values			
Assessment	<ul style="list-style-type: none"> • Assessment of content in R038 assessed through written test based on past paper examination questions. • Assessment of drawing skills in R039 Tasks 1 and 2. • Homework tasks from booklet 	<ul style="list-style-type: none"> • Assessment of R038 (exam) content through two tests based on past paper questions. • Assessment of CAD skills in R039 coursework (Task 4) • Assessment of technical drawing skills (R039 task 3) 	<ul style="list-style-type: none"> • Assessments take place at regular intervals using exam past paper questions and coursework criteria (R106 and R107) • 3 x 20 mark R105 assessments (completed using Google Forms) • Coursework assessed for R108 LO1