



# Engineering Key Stage 4 Curriculum Overview


Key Stage 4 Curriculum Journey: GCSE Engineering

Y10	Week 1 <span style="float: right;">←</span> <span style="float: right;">→</span> Week 39			
	<i>Introduction To Engineering – Metal Working</i>	<i>CAD / CAM - Modelling</i>	<i>Working with Plastics and Electronics</i>	<i>Systems and Developing NEA skills</i>
Key content (know that...Know how...)	<p><b><u>Introduction to the course</u></b></p> <ul style="list-style-type: none"> <li>Exam and NEA run down</li> <li>Content and topic coverage</li> </ul> <p><b><u>Orthographic Drawings</u></b></p> <ul style="list-style-type: none"> <li>What is an orthographic?</li> <li>Conventions and dimensions?</li> </ul> <p><b><u>All Materials theory – General Application and uses (Multi materials) – Properties</u></b></p> <ul style="list-style-type: none"> <li>Recap general material applications from KS3</li> <li>Recap material sources and uses (Linked to KS3)</li> <li>Mixed material products - alloys and composites</li> <li>General applications of materials in everyday (Research and evaluate)</li> <li>Working and physical properties of materials</li> </ul> <p><b><u>Concorde Project – Practical</u></b></p> <ul style="list-style-type: none"> <li>Recap workshop safety (KS3) – Risk assessment</li> <li>Tools and equipment used in KS3 and introduction to new tools used in Engineering</li> </ul>	<p><b><u>Engineering Formula – Testing and modelling</u></b></p> <ul style="list-style-type: none"> <li>Introduction to maths used in engineering - Formulas</li> <li>Costings</li> <li>Application to projects</li> <li>Testing and calculation methods</li> </ul> <p><b><u>Introduction to CAD/CAM</u></b></p> <ul style="list-style-type: none"> <li>What is CAD/CAM?</li> <li>Use of CAD in Engineering</li> <li>How CAD has developed</li> <li>Impacts on society from CAM / Automation</li> <li>3D printing and rapid prototyping</li> <li>Laser cutter</li> <li>Use of Fusion 360 /Autodesk and Google Sketchup</li> <li>3D Modelling project – Designing products based on a brief</li> <li>New and modern technologies</li> </ul>	<p><b><u>Plastic Manufacturing methods</u></b></p> <ul style="list-style-type: none"> <li>Injection moulding – Uses in practical applications and real-world products. Theory and demo</li> <li>Blow moulding – Uses in real world applications</li> <li>Vacuum forming – Project – Creating a mould and use of the machine</li> <li>Press forming – Examples and applications</li> </ul> <p><b><u>Alarm Project</u></b></p> <ul style="list-style-type: none"> <li>Electronics and electronic components</li> <li>Advances of electronics</li> <li>Uses of components within a circuit</li> <li>Introduction to soldering</li> <li>Creating a simple circuit</li> <li>Series and parallel</li> <li>PIC programming</li> <li>Logic programming</li> <li>Flowcharts and block diagrams</li> <li>Creating the mould for plastic casing</li> <li>Vacuum forming casing</li> <li>Cutting and working with plastic after vacuum forming</li> </ul>	<p><b><u>Systems theory</u></b></p> <ul style="list-style-type: none"> <li>Introduction to Engineering systems</li> <li>Hydraulic / Pneumatic</li> <li>Structural systems</li> <li>Electronic systems</li> <li>Mechanical systems</li> <li>Levers and linkages</li> <li>Forces</li> <li>Aerodynamics and practical testing</li> </ul> <p><b><u>Environmental Impact of Engineering</u></b></p> <ul style="list-style-type: none"> <li>Sustainability</li> <li>6R's</li> <li>Impact of engineering on wider world</li> <li>Carbon footprint</li> </ul> <p><b><u>NEA – June - Context released for the students</u></b></p> <ul style="list-style-type: none"> <li>NEA introduction and initial research</li> <li>NEA Research analysis</li> <li>NEA Design ideas</li> <li>NEA prototyping</li> </ul>

	<ul style="list-style-type: none"> <li>• Marking out using template scribes on to metal – Engineers blue</li> <li>• Cutting and shaping metal</li> <li>• Filing and drilling metal</li> <li>• Using a metal lathe</li> <li>• Brazing</li> <li>• Use of CAM to create moulds</li> <li>• Pewter casting</li> <li>• Riveting</li> <li>• Powder coating</li> <li>• CNC vinyl cutting</li> <li>• Finishing and final assembly</li> </ul> <p><b><u>Production Planning</u></b></p> <ul style="list-style-type: none"> <li>• What are production plans?</li> <li>• Why do we write production plans?</li> <li>• Quality control and quality assurance</li> </ul>		<ul style="list-style-type: none"> <li>• Sanding and finishing plastic – adding hand cut vinyl stickers (Use of craft knives and scissors)</li> <li>• Assembly of electronics to plastic casing</li> </ul>	
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Prior Knowledge</b></p>	<p><b><u>Introduction to the course</u></b></p> <ul style="list-style-type: none"> <li>• Options information evening</li> <li>• Speaking to staff and other students on the course</li> </ul> <p><b><u>Orthographic Drawings</u></b></p> <ul style="list-style-type: none"> <li>• Using pencil and ruler</li> <li>• Reading and marking measurements</li> <li>• Converting measurements</li> </ul> <p><b><u>All Materials theory – General Application and uses (Multi materials) – Properties</u></b></p>	<p><b><u>Engineering Formula – Testing and modelling</u></b></p> <ul style="list-style-type: none"> <li>• Basic maths functions – Add / Subtract / Divide / Multiply</li> <li>• Use of calculator and scientific functions</li> </ul> <p><b><u>Introduction to CAD/CAM</u></b></p> <ul style="list-style-type: none"> <li>• Use of a computer to save and open files</li> <li>• CAD/CAM knowledge (Advantages and disadvantages) – Y7/Y8</li> </ul>	<p><b><u>Plastic Manufacturing methods</u></b></p> <ul style="list-style-type: none"> <li>• Different types of plastic</li> <li>• Plastic products</li> <li>• Uses and applications of plastics within society</li> <li>• Name of manufacturing methods</li> </ul> <p><b><u>Alarm Project</u></b></p> <ul style="list-style-type: none"> <li>• Basic understanding of electronics and simple components with their uses</li> <li>• Soldering understanding – How to do and safety (Y8 recap)</li> <li>• Different types of circuits and how to draw a circuit</li> </ul>	<p><b><u>Systems theory</u></b></p> <ul style="list-style-type: none"> <li>• Recap KS3 systems understanding – KS3</li> <li>• Uses of different systems in different types of engineering projects</li> <li>• Uses of linkages in engineering products</li> <li>• Recap forces – linked to KS3</li> <li>• Different forces and how they can change / act on different materials / products</li> </ul> <p><b><u>Environmental Impact of Engineering</u></b></p>

	<ul style="list-style-type: none"> <li>Recap general material applications</li> <li>Recap material sources and uses</li> <li>Mixed material products</li> <li>General applications of materials in everyday (Research and evaluate)</li> <li>Working and physical properties</li> </ul> <p><b><u>Concorde Project – Practical</u></b></p> <ul style="list-style-type: none"> <li>Use of tools and equipment – Linked to KS3 practical learning</li> <li>General understanding of health and safety and risk assessment</li> <li>Names of tools and their applications and materials to be used on</li> <li>General assembly</li> <li>Use of motor skills</li> </ul> <p><b><u>Production Planning</u></b></p> <ul style="list-style-type: none"> <li>Writing and following information</li> <li>Creating a sequence of steps and applying this to projects</li> </ul>	<ul style="list-style-type: none"> <li>Basic understanding of 3D modelling</li> </ul>	<ul style="list-style-type: none"> <li>Simple flow chart application – Start / Process / Quality / Finish</li> <li>Use of tools and equipment – Linked to KS3 for practical application</li> <li>General understanding of health and safety and risk assessment</li> <li>Names of tools and their applications</li> <li>Assembly and use of fastenings and glue</li> </ul>	<ul style="list-style-type: none"> <li>Recap Sustainability knowledge from KS3. What is sustainability and general environmental facts and knowledge</li> <li>6R's – Recap. Naming the 6R's – Application of what the words mean</li> <li>Understanding the word impact and what this means for engineering and giving examples</li> <li>Carbon footprint – recap from KS3 prior knowledge. What does this mean? How this has impacted on them? Ways of reducing carbon footprint – Cross circular knowledge (Geog)</li> </ul> <p><b><u>NEA – June - Context released for the students</u></b></p> <ul style="list-style-type: none"> <li>No prior knowledge of the NEA context</li> <li>Recapping skills learned in KS3 and now KS4 to apply to the brief</li> <li>Recap materials and different methods of manufacturing</li> </ul>
<b>Assessment Objectives</b>	<ul style="list-style-type: none"> <li>AO1: Demonstrate knowledge and understanding of engineering principles and processes.</li> <li>AO2: Apply knowledge, understanding and skills in different contexts, including through the use of a range of tools, equipment, materials, components and manufacturing processes.</li> <li>AO3: Analyse and evaluate evidence in relation to a range of engineering contexts.</li> </ul>			

<b>Assessments</b>	AO2 – Concorde practical assessment AO1 – End of unit assessment – Test based knowledge	AO3 - Evaluate 3D CAD model linked to specification AO1 – End of unit assessment – Test based knowledge	AO2 – Alarm Project practical assessment AO1 – End of unit assessment – Test based knowledge	AO1 – End of year Mock – Based on Y10 learning and AQA Specification
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Y11	Week 1  Week 39	
	<i>NEA – 40% of course waiting</i>	<i>Exam Theory 60%</i>
Key content (know that...Know how...)	<i>Due to 2 hour per week at option subjects. They students will focus on completing 1 lesson per week of NEA work and 1 lesson per week of exam theory to ensure that the different content is delivered.</i>	
	<p><b><u>NEA – Independent Project</u></b></p> <p>Students have started NEA at the end of Y10 when the initial brief was released. They are to work on and produce the following using a PowerPoint document also with physical models and drawings / sketches.</p> <ul style="list-style-type: none"> <li>• Detailed explanation of what the problem involves</li> <li>• Alternative solutions – in outline</li> <li>• A solution that integrates different types of system – both electrical/ electronic and mechanical</li> <li>• Detailed design with sufficient detail to produce a fully working solution including any systems used to control the device</li> <li>• Explanations of how the system functions.</li> <li>• Production plans</li> <li>• Manufacturing diary</li> <li>• Evidence of testing, planning and carrying out the test(s)</li> <li>• Reports of any actions needed after testing</li> <li>• An evaluation of the effectiveness of the solution</li> <li>• Photographic evidence of the final manufactured prototype.</li> </ul>	<p><b><u>Exam Theory</u></b></p> <p><i>Students will be taught a range of theory content. Some theory content will be recall and some will be new. Students will have a range of exam questions to complete based on the theory they have learned.</i></p> <ul style="list-style-type: none"> <li>• Understanding the exam</li> <li>• Exam language</li> <li>• Layout of questions and the paper</li> </ul> <p><b><u>Materials and their properties</u></b></p> <ul style="list-style-type: none"> <li>• Metals and alloys</li> <li>• Polymers</li> <li>• Composites</li> <li>• Other materials</li> <li>• Material costs and supply</li> <li>• Factors influencing design of solutions</li> </ul> <p><b><u>Engineering manufacturing processes</u></b></p> <ul style="list-style-type: none"> <li>• Additive manufacturing</li> <li>• Material removal</li> <li>• Shaping</li> <li>• Casting and moulding</li> <li>• Joining and assembly</li> <li>• Heat and chemical treatment</li> <li>• Surface finishing</li> </ul> <p><b><u>Systems</u></b></p> <ul style="list-style-type: none"> <li>• Mechanical systems</li> <li>• Electrical systems</li> </ul>

		<ul style="list-style-type: none"> <li>• Electronic systems</li> <li>• Structural systems</li> <li>• Pneumatic systems</li> </ul> <p><b><u>Testing and investigation</u></b></p> <ul style="list-style-type: none"> <li>• Modelling and calculating</li> <li>• Testing</li> <li>• Aerodynamics</li> </ul> <p><b><u>The impact of modern technologies</u></b></p> <ul style="list-style-type: none"> <li>• Society</li> <li>• The environment</li> <li>• Future of engineering and modern world</li> </ul> <p><b><u>Practical engineering skills</u></b></p> <ul style="list-style-type: none"> <li>• Logic approach to solving a problem</li> <li>• Use of a range of different tools and equipment for different applications</li> <li>• Use of CAD / CAM</li> <li>• How to select the correct parts for a range of engineering tasks</li> </ul>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Prior Knowledge</b></p>	<p><b><u>NEA – Independent Project</u></b></p> <ul style="list-style-type: none"> <li>• Students will recap on prior knowledge learned throughout Y10 and Y11 to help them develop their NEA project.</li> <li>• Recap KS3 knowledge of tools not used in Y10 / Y11 but used previously at KS3 in Design and Technology.</li> <li>• Students will have to undertake independent research to help them develop their ideas and designs for their chosen solution.</li> <li>• General understanding of the project / product they are going to make</li> <li>• Materials knowledge and what different products can be made from</li> <li>• Joining techniques – done through research of existing products and taking products apart (Primary Research)</li> </ul>	<p><b><u>Exam Content</u></b></p> <p>Prior knowledge will be relevant throughout all areas of exam revision for topics that have been previously covered in Y10 or KS3. All topics will have areas for recall and links to past projects and skills.</p> <p>Prior knowledge will be checked at the start of each unit area to ensure the students can relate to the subject / topic area and have a base for starting to develop further.</p>

<b>Assessment Objectives</b>	<ul style="list-style-type: none"> <li>• AO1: Demonstrate knowledge and understanding of engineering principles and processes.</li> <li>• AO2: Apply knowledge, understanding and skills in different contexts, including through the use of a range of tools, equipment, materials, components and manufacturing processes.</li> <li>• AO3: Analyse and evaluate evidence in relation to a range of engineering contexts.</li> </ul>	
	<p>Application of skills, knowledge and understanding in a practical context. Analysis and evaluation of evidence.</p> <ul style="list-style-type: none"> <li>• A brief set by AQA released on 1 June in the first year of study.</li> <li>• 80 marks</li> <li>• 40% of GCSE</li> </ul>	<p>Though the 'Practical engineering skills' section will predominantly be assessed through the NEA, some questions in the written exam will relate to practical contexts and students will need to apply their understanding within these contexts.</p> <p><b><u>Written exam</u></b></p> <ul style="list-style-type: none"> <li>• 2 hours</li> <li>• 120 marks</li> <li>• 60% of GCSE</li> </ul>
<b>Assessments</b>	<p>NEA cannot be feedback upon live while the students are working on it. Generic feedback can be given to help support the students.</p> <p>NEA is internally moderated and then sent to the exam board by the deadline.</p>	<p>November Mock series Feb Mock series</p> <p>Summative assessments used throughout the year – trackers / class tests and quizzes used to help track progress</p>