Engineering and STEM Curriculum Overview Plan

Whole school curriculum intent Develop a broad and balanced curriculum that enables students to learn, recall and apply knowledge and skills across different contexts, supported by a robust and consistent approach to assessment. This will lead to successful and resilient lifelong learners who can cope in a range of changing contexts.
Key stage 3/4 subject curriculum intent Engineering: To equip students with the necessary engineering knowledge and confidence so that they can inform their career choices. STEM: Develop an understanding of design, materials and an appreciation of the world around us so that they value resources and reduce waste.

Specification for BTEC: https://qualifications.pearson.com/content/dam/pdf/btec-tec-awards/engineering/2017/Specification-and-sample-assessments/Pearson-BTEC-L12-Tech-Award-in-Engineering-Spec.pdf

National Curriculum for Design Technology: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/239089/SECONDARY_national_curriculum_-_Design_and_technology.pdf

Please note: due to machine and equipment availability, this map may change order.

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Year Group		Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 7	**Topic**	**7A Crash Test Dummy**	**7B Circuits 1 – Mini torch and greetings card**	**7C Materials 1 (Polymers) – Keyring**	**7D Coding 1 – Games/Robot Car**	**7E CADCAM 1 Photo-frame**	**7F Data 1 - Rockets**
	Core knowledge from this topic	Students need to know the 3 parts to the design process: design, make, evaluate Students need to know how to draw and annotate a basic design Students need to know how to explain how designs solve issues Students need to know the health and safety routines when using equipment Students need to know how to follow their design to make a crash test vehicle Students need to know how a design is altered during manufacture Students need to know how to carry out fair testing of vehicles Students need to know how to evaluate designs and suggest improvements that could be made Students need to know how to draw accurately in 2D	Students need to know how to build and draw complete circuits Students need to know how to explain circuits in terms of insulators and conductors Students need to know how to choose suitable conductors and insulators for designs Students need to know the circuit symbols for a cell, wire, LED and switch Students need to know that LEDs use less energy Students need to know that more resistance is needed in circuit when using LEDs Students need to know how to design circuits and housings to fulfil a design brief Students need to know how to write a simple specification Students need to know how LDRs and length of conductors affect the resistance in a circuit (using the buzz-bees) Students need to know what LEDs and LDRs are and how they work in a circuit	Students need to know the meaning of specification Students need to know how to design a specification for target groups of people Students need to know how to design to specification Students need to know how to annotate designs and describe features Students need to know the safety and routines when using equipment in the workshop Students need to know how to use hand tools, powered fret saw and pedestal drill safely Students need to know how to evaluate the design against the specification and its use by target groups Students need to know 5S – industry standard for organisation and cleanliness	Students need to know how to use block based coding language to write instructions Students need to know how processors follow code a step at a time Students need to know how to use the BBC microbits website to code. Students need to know how to transfer data to BBC microbit Students need to know how to use random variables to make games on microbit Students need to know how to write code to control a robot car Students need to know how coding can be translated into movement Students need to know how to write code to control LEDs in sequences Students need to know how to use sensors as inputs	Students need to know the meaning of "CADCAM" Students need to know how to use RDworks to draw basic shapes Students need to know the different types of etching (scan and vector) Students need to know how to design a 2D item to cut – in one piece! Students need to know how to safely soften acrylic to bend it Students need to know how to evaluate the finished workpiece Students need to know the different types of materials that can be laser cut and their limitations Students need to know impact of laser cut materials on the environment Students need to know the possibilities and limitations of laser cutting	Students need to know the forces involved in launching rockets from Earth Students need to know the energy transfers in launching rockets Students need to know the design, make and evaluate process Students need to know how to change variables and collect data Students need to know how to use data to analyse performance Students need to know how to write a conclusion based on data and link to the scenario Students need to know how to draw accurately in 2D
	Links to the national curriculum	identify and solve their own design problems and understand how to reformulate problems given to them	understand how more advanced electrical and electronic systems can be powered and used in their products test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interested groups	develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations use research and exploration, such as the study of different cultures, to identify and understand user needs	apply computing and use electronics to embed intelligence in products that respond to inputs [for example, sensors], and control outputs [for example, actuators], using programmable components [for example, microcontrollers].	develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools investigate new and emerging technologies understand and use the properties of materials and the performance of structural elements to achieve functioning solutions	develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools analyse the work of past and present professionals and others to develop and broaden their understanding
	Previous content that this topic builds upon	NA	NA	What is a specification? Annotating designs Be able to evaluate designs and make improvements	NA	What is a specification? Annotating designs Be able to evaluate designs and make improvements Justification of designs	What is a specification? Annotating designs Be able to evaluate designs and make improvements Justification of designs

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	Key vocabulary	Forces Impact Crumple zone Drag Friction Design Evaluate Adapt	Insulator Conductor LED Diode Wire Complete circuit Cell Battery Switch Resistance Specification Design brief	Specification Annotation Product Evaluation Polymer Pedestal Drill Fret Saw Hand Tools Target group Materials	Coding language Block based coding Processor Microbit Transfer Variables Robot Movement Sequences Input Sensor	Polymer Material Laser Laser Cutting 2D CADCAM Etch Limitation Possibility Environment Vector	Streamlining Thrust Weight Gravity Mass Forces Air resistance Trajectory Variable Process Data Scenario Atmosphere Orbit
	Development of cultural capital	Develop an awareness of road safety and adaptations made to cars in order to make them safer for passengers and pedestrians for example electric windows allow drivers to concentrate or windscreen wipers are concealed below the bonnet to prevent a hit pedestrian being punctured.	Understand the need for low energy components and that using them will reduce carbon emissions and also saves money on energy bills for example LED bulbs in houses use far less energy than energy saving bulbs.	Understand diversity and the need to understand target groups for design and production for example what different colours symbolise in different cultures and in the LBGT+ community.	Understand the uses, limitations and dangers of using robots in society for example self-driving cars giving a false sense of security to drivers.	Understand that automation can save time and money, but also that it has limitations for example the cost of research, set up and hardware or that a laser cutter can only cut 2D	Understand the advances made in engineering and science because of space travel for example the development of memory foam for sleeping space has now become a common place material in Earth mattresses
	Development of reading	https://www.theaa.com/breakdown-cover/advice/evolution-of-car-safety-features Read the source from the AA and annotate a picture of a car to describe the safety features from the article.	https://www.telegraph.co.uk/business/energy-efficiency/why-leds-are-good-for-businesses/ Read the source from the Daily Telegraph and complete the information table based on the article.	https://www.weforum.org/agenda/2015/02/5-synthetic-materials-that-will-shape-the-future/ Read the source from the World Economic forum and summarise how each of these new polymers can solve a problem	https://www.theguardian.com/society/2020/sep/07/robots-used-uk-care-homes-help-reduce-loneliness Read the source from the guardian and write an argument supporting the use of robots in care homes.	https://www.researchgate.net/publication/231009441_Lasers_in_medicine Read the source and complete the comprehension activity.	https://www.britannica.com/topic/Laika Read the source and summarise the behaviours that would be unacceptable nowadays.
	Concepts –what will students be able to do at the end of the topic	Annotate designs Design safety features Understand how to reduce impact forces Be able to evaluate designs and make improvements	Make simple circuits and apply this to a practical project Be able to design a circuit and housing to meet a simple design brief	What is a specification? Annotating designs Justification of designs	Basic coding using the BBC microbit Use of sensors to control actions of a robot car	What is a specification? How to design to specification. Annotating designs Justification of designs Be able to evaluate designs and make improvements Use a prototype Appreciate the value of materials and impact on the environment	Analyse performance using data collection. Annotate and justify design improvements
Year Group		**Autumn 1**	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Year 8	**Topic**	**8A CADCAM 2 – Jitterbug**	**8B Coding 2 – Sensors/MiniMu**	**8C Materials 2 (Fabrics) – Pencil Case**	**8D Data 2 - Race for the line**	**8E Materials 3 (Wood) – Box Dice Game**	**8F Circuits 2 – Steady Hand Game**
	Core knowledge from this topic	Students need to know how to use prototypes to design 3D animals to be cut in 2D and assembled Students need to know how to make slots correct width to assemble project	Students need to know how to use BBC microbits to code musical glove. Students need to know how to use movement/direction as an input. Students need to know how to use block based coding	Students need to know names of examples and properties of manmade and natural fabrics Students need to know the value of fabrics in particular throwaway fashion and that fabrics can be recycled	Students need to know how to develop design processes Students need to know how to draw 2D elevations and 3D isometric drawings Students need to know the build and testing procedures	Students need to know the names of types of wood and which ones are sustainable Students need to know that plywood is a composite and its structure	Students need to know how to build and draw complete circuits Students need to know how to explain circuits in terms of insulators and conductors

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		Students need to know the different types of materials that can be laser cut and their limitations Students need to know the impact of materials on the environment Students need to know how to draw a basic 3D design on google sketch up Students need to know how 3D printers work Students need to know the possibilities and limitations of 3D printing and laser cutting	language to solve problems based on a specific brief Students need to know how coding can be translated into sound Students need to know how to use Boolean variables to make true or false decisions to control output Students need to know how to use inbuilt sensors as inputs	Students need to know that items can be altered or embellished in order to upcycle Students need to know that fabrics can be dyed and the dyes need to be fixed Students need to know how to hand sew a seam Students need to know how to machine sew a seam Students need to know how to safely use an iron and ironing board Students need to know how to use icons and initials to identify their work	Students need to know safety and workshop routines when using equipment Students need to know workshop safety and tidiness (5S – industry standards) Students need to know how streamlining and weight affect speed of rocket cars Students need to know how to evaluate designs based on performance Students need to know how to explain the safety of testing procedures Students need to know 5S – industry standard for organisation and cleanliness	Students need to know how to mark out work pieces so that materials are not wasted. Students need to know a range of adhesives and which to use and how to use it safely Students need to know how to measure accurately Students need to know how to use the powered fret saw safely Students need to know how to use the disc sander safely Students need to know how to use the pillar drill safely Students need to know how to assemble a work piece taking into account the thickness of the material Students need to know how to finish a product to remove sharp edges Students need to know 5S – industry standard for organisation and cleanliness	Students need to know how to choose suitable conductors and insulators for designs Students need to know the circuit symbols for a cell, wire, resistor and buzzer Students need to know how to calculate resistance in order to protect components Students need to know how to design circuits and housings to fulfil a design brief Students need to know how use a soldering iron safely Students need to know why we no longer use lead solder and the disadvantages of lead-free solder
	Links to the national curriculum	develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools investigate new and emerging technologies understand and use the properties of materials and the performance of structural elements to achieve functioning solutions	apply computing and use electronics to embed intelligence in products that respond to inputs [for example, sensors], and control outputs [for example, actuators], using programmable components [for example, microcontrollers].	use research and exploration, such as the study of different cultures, to identify and understand user needs develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture	develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture analyse the work of past and present professionals and others to develop and broaden their understanding understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists understand how more advanced mechanical systems used in their products enable changes in movement and force	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 and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture
	Previous content that this topic builds upon	What is a specification? How to design to specification. Annotating designs Justification of designs	Basic coding using the BBC micro bit Use of sensors to control actions	What is a specification? How to design to specification. Annotating designs Justification of designs	What is a specification? Annotating designs Be able to evaluate designs and make improvements	Appreciate the value of materials and impact on the environment	Be able to design circuits including the use of resistors to protect components

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		Be able to evaluate designs and make improvements Use a prototype Appreciate the value of materials and impact on the environment		Be able to evaluate designs and make improvements Appreciate the value of materials and impact on the environment	Justification of designs Use of laser cutting, 3D printing and hand tools 5S from workshop use in Y7 2D drawing in Y7	Select and use a range of hand tools 5S from workshop use in Y7	Be able to design a product to meet a specification and target audience Be able to evaluate a product, carry out a peer review and make suggestions for improvement
	Key vocabulary	Polymer Wood Material Thermosetting Thermoforming Composite Laser Laser Cutting 2D 3D CADCAM Etch Limitation Possibility Environment Vector 3D printing Coordinates	Coding language Block based coding Processor Micro bit Transfer Variables Robot Movement Sequences Input Sensor Boolean variable Inbuilt True/False decision	Cotton Calico Natural Manmade Polyester Nylon Needle Pin Thread Bias Recycle Embellish Alter Seam Baste Zip Iron Sewing Machine	Safety Workshop Hand tools Coping Saw Specification Justify Streamlining Weight Force Rocket Firework Explosive Gun powder Performance Testing	Safety Workshop Timber Plywood Composite Sustainable Structure Adhesive Powered Fret Saw Powered Disc Sander Pillar Drill Surface Finish	Circuit Cell Battery Buzzer Resistance Ohms Insulator Conductor Component Soldering Iron Lead-free Solder
	Development of cultural capital	Understand that automation can save time and money, but also that it has limitations and an impact on the work force and society for example people are employed as robot programmers and maintenance, but a lot of unskilled jobs are no longer available.	Understand the uses, limitations and dangers of using automated technology using sensors in society for example pedestrian detection systems on cars may make the driver less cautious.	Understand that clothing can be mended, often easily, avoiding the need to throwaway and buy new or wear inappropriate items for example school trousers or blazers that split on the seams can often be quickly repaired meaning uniform is still smart.	Understand how research and development can link to everyday advances in technology for example the wind tunnel modelling simulation that was developed for bloodhound will be used in industry to reduce prototype costs be testing computer models first.	Understand the range of materials available and that they can be sustainable for example pinewood is fast growing and therefore more sustainable than hard wood varieties.	Understand the need for resistance in a circuit as excess current can damage components Understand the need for surge protection when using delicate electronics and computers
	Development of reading	https://www.weforum.org/agenda/2020/05/robots-workers-industries-employment Read the source and describe the patterns in employment described in the source (scaffolded questions). Explain why this happened.	https://www.smithsonianmag.com/history/decoding-antikythera-mechanism-first-computer-180953979/ Read the source and complete the table with the theories surrounding the antikythera mechanism and the evidence that supports those theories.	https://www.ethicalconsumer.org/fashion-clothing/ethics-cotton-production Read the source and write definitions for the words listed. In addition, describe the conditions of cotton farmers and the importance of fair trade. (Fair Trade Fortnight - 22/2/22)	https://www.guinnessworldrecords.com/records/hall-of-fame/andy-green-fastest-car-land-speed-record Andy Green was born in Atherstone in 1962. Read the source and answer the comprehension questions.	https://www.woodlandtrust.org.uk/trees-woods-and-wildlife/british-trees/how-trees-fight-climate-change/ Read the source and answer the questions about how woodland can reduce the effects of climate change – not just absorbing CO_2.	http://www.thepeoplehistory.com/kidselectronic.html Read the source and then use it to create a time line of electronic toys.
	Concepts –what will students be able to do at the end of the topic	What is a specification? How to design to specification. Annotating designs Justification of designs Be able to evaluate designs and make improvements Use a prototype	Use of different inputs Use of variables to make decisions	Be able to sew a seam by hand and by using a sewing machine Be able to use an iron safely Appreciate the value of materials and impact on the environment	Analyse performance using data collection. Evaluate and improve designs Appreciate the value of materials Select and use a range of hand tools	Be able to use some hand tools and machine tools and be able to construct simple objects. Be able to work safely to protect themselves and others. Appreciate the value of materials and plan their use to avoid waste.	Be able to design and build simple circuits Be able to calculate the resistance needed in a circuit Be able to build a housing around a circuit so that it can perform its function

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		Understand the possibilities and limitations of 3D printing and laser cutting Appreciate the value of materials and impact on the environment					
Year Group		**Autumn Term 1**	**Autumn Term 2**	**Spring Term 1**	**Spring Term 2**	**Summer Term 1**	**Summer Term 2**
Year 9	**Topic**	**9A Data 3 – Wind Turbines**	**9B CADCAM 3/Circuits 3 – Light-up sign**	**9C Materials 4 (Metals) – Dog Tags**	**9D Production Data – Dog Tags**	**9E – Design Process – Credit Card Tool or Bag for Life**	**9F – Design Project – Mini angle poise lamp or dance-off robot**
	Core knowledge from this topic	Students need to know that wind turbines use magnetic fields and motion to produce a p.d. Students need to know that the faster the motion, the greater the p.d. Students need to know the environmental impact of renewable energy resources Students need to know importance of renewable energy resources Students need to know how to draw 3D isometric drawings Students need to know the design, test and evaluation process Students need to know how to collect and record data Students need to know how to draw line graphs Students need to know how to analyse data Students need to know how to link data to scenarios	Students need to know how to draw 2D elevations and 3D isometric drawings Students need to know how to use prototypes to design light up signs using different techniques to make different parts to join together and to plan the space required for the circuit inside Students need to know the different types of materials that can be laser cut and 3D printed and their limitations Students need to know the impact of polymers on the environment Students need to know how to draw a precise 3D design on google sketch up Students need to build and test a circuit to light up their sign Students need to calculate the size of the resistor needed in the circuit Students need to know how to safely solder wires into a USB plug and the components in the circuit	Students need to know how to draw 2D elevations and 3D isometric drawings Students need to know how to compare properties of materials Students need to know the names and uses of hand tools (tin snips, scribe, rule, centre punch, metal files, deburring tool, ball pein hammer) Students need to know how to use hand tools safely, how to store them and why they are counted before and after use Marking out workpieces Students need to know how to work to engineering drawings Students need to know what tolerances on a drawing mean Students need to know how to carry out the following using hand tools: Cutting, sawing, filing, deburring, drilling, stamping, polishing Students need to know 5S – industry standard for organisation and cleanliness Students need to know how to compare the properties of the materials they have used	Students need to know how to read an engineering drawing Students need to know what tolerances on a drawing mean Students need to know inspection techniques to ensure workpieces are within tolerance Students need to know how to use Vernier callipers Students need to know how to use micrometers Students need to know how to evaluate their work and the processes used Students need to know what should be included in a production plan: processes, materials, H & S Students need to know how to write a production plan in order Students need to know how to analyse production data using the whole class' data	Students need to know why research of existing designs is important Students need to know how to evaluate existing designs and judge them against specification criteria Students need to know how to write a specification Students need to know how to adapt an existing design Students need to know how to draw designs and annotate them with design features Students need to know how to justify their designs against the specification Students need to know how to analyse designs and justify the best design Students need to know the value of prototypes when presenting their design ideas	Students need to know how to draw 2D elevations and 3D isometric drawings Students need to know how to write a specification based on a brief Students need to know how to design to meet their specification Students need to know how to annotate their design to show that it has met their specification Students need to know how to use previous skills and knowledge to solve challenges Students know how to present designs and take peer review advice to improve designs Students know how to evaluate a project constructively and make design improvement Students need to know how to mix coloured lights to create any colour lighting (using the light-bee)
	Links to the national curriculum	identify and solve their own design problems and understand how to reformulate problems given to them investigate new and emerging technologies understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists	develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools 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	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 understand and use the properties of materials and the performance of structural	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	use research and exploration, such as the study of different cultures, to identify and understand user needs develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools select from and use specialist tools, techniques, processes, equipment and machinery	develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools understand how more advanced electrical and

		understand and use the properties of materials and the performance of structural elements to achieve functioning solutions	materials, components and ingredients, taking into account their properties	elements to achieve functioning solutions		precisely, including computer-aided manufacture	electronic systems can be powered and used in their products apply computing and use electronics to embed intelligence in products that respond to inputs [for example, sensors], and control outputs [for example, actuators], using programmable components [for example, microcontrollers].
	Previous content that this topic builds upon	Analyse performance (of rockets and rocket cars) using data collection. Annotate and justify design improvements (rockets). 2D drawing in Y7 and 2D elevations and isometric drawing in Y8	What is a specification? How to design to specification. Annotating designs Justification of designs Be able to evaluate designs and make improvements Use of prototypes to make laser cut animals Understand the possibilities and limitations of 3D printing and laser cutting Appreciate the value of materials and impact on the environment 2D drawing in Y7 and 2D elevations and isometric drawing in Y8	Appreciate the value of polymers (Y7) and wood, fabric (Y8) and their impact on the environment Select and use a range of hand tools (RTTL rocket cars) 5S from workshop use in Y7 2D drawing in Y7 and 2D elevations and isometric drawing in Y8	5S from workshop use in Y7 2D drawing in Y7 and 2D elevations and isometric drawing in Y8	What is a specification? How to design to specification. Annotating designs Justification of designs Be able to evaluate designs and make improvements Appreciate the value of materials and impact on the environment	What is a specification? How to design to specification. Annotating designs Justification of designs Be able to evaluate designs and make improvements Appreciate the value of materials and impact on the environment
	Key vocabulary	Wind turbine Renewable Sustainable Generator effect Blade Tower Potential difference Current Voltmeter Scale Design Evaluation Scenario	Prototypes Fluorescent Material PLA Polymer Environment Coordinates Component Resistor Ohms Potential Difference Current Solder Lead-free Soldering Iron USB	Properties Aluminium Brass Copper Malleability Hardness Lustre Engineer's blue Scribe Rule Centre punch Tin snips Bastard file Medium file Smooth file Hacksaw Deburring tool Burr Chamfer Drill bit Ball pein hammer Tolerance	Aluminium Brass Copper Inspection Dimensions Production plan Vernier callipers Micrometer Anomaly Data Error Out of tolerance In tolerance Scrap	Work piece Hand tool Design Identify Specification Evaluate Research Criteria Justify Adapt Prototype Advantage Disadvantage	Work piece Design Identify Specification Evaluate Research Criteria Justify Adapt Prototype Advantage Disadvantage RGB – Red Blue Green Cyan Magenta Blue White
	Development of cultural capital	Understand the need for renewable technologies in a sustainable future for example natural gas is a finite resource	Understand the risks and dangers of high current and the damage that can be done to components if circuits are not	Increase the confidence to use hand tools to do simple tasks which may help students later in life for example drills or hand	Understand how to minimise waste by planning how to use materials for example when laying flooring or wrapping gifts.	Increase the confidence to use hand tools or simple machinery to do simple tasks, which may help students later in life for	Understand how screens use RGB lighting to make any coloured light and this helps understand LED lighting, how

		and becoming more scarce so alternative technologies are needed.	built correctly. In particular when adding components in parallel or sockets into an extension lead which can lead to overheating and fire.	tools when completing DIY tasks in the home or garden.		example sewing machines or hand tools when completing DIY tasks in the home or garden.	TV and other electronic screens work and how screens become damaged.
	Development of reading	https://friendsoftheearth.uk/climate/fracking-facts Read the source and answer the questions about the arguments against fracking and also the use of biased sources.	https://www.nature.com/articles/s41598-020-70086-y Read the source and answer the comprehension questions – this is better than science fiction!	https://www.timeoutdoors.com/expert-advice/cycling/components/materials-in-bike-construction Read the source and use the table to evaluate the use of different materials.	https://www.riflemantours.co.uk/history-of-military-dog-tags/ Read the source and write a letter to explain to Neville Chamberlain in 1939 what the tags should have been made from.	Malaysia endures toxic legacy of UK plastic waste exports | Greenpeace UK Read the source material and answer the comprehension questions.	What is RGB? How is it used? What about RGB lighting? | Digital Citizen Read the source material and answer the comprehension questions about RGB and CMYK.
	Concepts –what will students be able to do at the end of the topic	Be able to follow the design cycle: Identify problem – Research – Build Prototype – Test – Improve – Present Solutions Analyse and present production data	Calculate resistance Build circuits and use a soldering iron safely to complete it Combine production techniques in a single product	Be able to plan to make an engineering component Read a drawing and follow it Mark out a work piece Use a range of hand tools Maintain the workshop in a clean and tidy manner Inspect a workpiece Use inspection tools	Be able to inspect a workpiece and compare it to the drawing and make a decision on whether it is in tolerance. Understand the impact and cost of out of tolerance work in terms of time, energy, materials and money.	Be able to research existing designs, improve them and make a prototype. Be able to apply the process to any project	Students can follow the engineering design process including feedback from peers and acting on it.
Year Group		**Autumn Term 1**	**Autumn Term 2**	**Spring Term 1**	**Spring Term 2**	**Summer Term 1**	**Summer Term 2**
Year 10	**Topic**	Exam Skills (C3) Including elastic band, cantilever and pendulum past papers	Engineering Design Process (C1B - practise) Remote Control Car Stand	Exam Skills (C3) Including Mock Exams (Sand Flow)	Engineering Industry (C1A) Based on local car industry	Engineering Design Process (C1B) Reading Lamp Design	Engineering Design Process (C1B) Reading Lamp Design
	Core knowledge from this topic	A Carry out a process to meet the needs of an engineering brief Learners will develop an understanding of practical procedures and explore how to record, collect and interpret data in an engineering context. A1 Carry out a process A2 Recording the process A3 Interpretation of data B Provide a design solution for an engineered product against the needs of an engineering brief Learners will develop an understanding of how to interpret a brief and explore design ideas, including their viability as a final solution. B1 Interpretation of a given brief for an engineered product B2 Redesign B3 Evaluation C Provide solutions to meet the needs of an engineering brief Learners will develop an understanding of how to analyse	Learning aim B: Explore engineering skills through the design process B1 The design process Through practical exercises, learners will produce solutions to problems using different combinations of engineering skills, including designing as part of the engineering design and make process. The engineering design and make process: define the problem, develop possible solutions, choose a solution, design and model the solution, evaluate outcome of project, work in a team.	A Carry out a process to meet the needs of an engineering brief Learners will develop an understanding of practical procedures and explore how to record, collect and interpret data in an engineering context. A1 Carry out a process A2 Recording the process A3 Interpretation of data B Provide a design solution for an engineered product against the needs of an engineering brief Learners will develop an understanding of how to interpret a brief and explore design ideas, including their viability as a final solution. B1 Interpretation of a given brief for an engineered product B2 Redesign B3 Evaluation C Provide solutions to meet the needs of an engineering brief Learners will develop an understanding of how to	Learning aim A: Understand engineering sectors, products and organisations, and how they interrelate A1 Engineering sectors, engineered products and interconnections Learners will examine the interconnection between engineering sectors and engineered products. A2 Engineering organisations, functions, job roles and career progression Learners will examine organisations, functions and job roles, developing their understanding of how these contribute to career progression in engineering.	Learning aim B: Explore engineering skills through the design process B1 The design process Through practical exercises, learners will produce solutions to problems using different combinations of engineering skills, including designing as part of the engineering design and make process. The engineering design and make process: define the problem, develop possible solutions, choose a solution, design and model the solution, evaluate outcome of project, work in a team.	Learning aim B: Explore engineering skills through the design process B1 The design process Through practical exercises, learners will produce solutions to problems using different combinations of engineering skills, including designing as part of the engineering design and make process. The engineering design and make process: define the problem, develop possible solutions, choose a solution, design and model the solution, evaluate outcome of project, work in a team.

		information in an engineering context and will explore how to select a suitable solution and implement it to meet the brief. C1 Analysing engineering information associated with the problem C2 Selecting a solution C3 Problem solution		analyse information in an engineering context and will explore how to select a suitable solution and implement it to meet the brief. C1 Analysing engineering information associated with the problem C2 Selecting a solution C3 Problem solution			
	Links to the national curriculum (if applicable)	BTEC Tech Award in Engineering Level 1/2 Component 3 Learning Aims 3A, 3B, 3C	BTEC Tech Award in Engineering Level 1/2 Component 1 Learning Aims 1B	BTEC Tech Award in Engineering Level 1/2 Component 3 Learning Aims 3A, 3B, 3C	BTEC Tech Award in Engineering Level 1/2 Component 1 Learning Aims 1A	BTEC Tech Award in Engineering Level 1/2 Component 1 Learning Aims 1B	BTEC Tech Award in Engineering Level 1/2 Component 1 Learning Aims 1B
	Previous content that this topic builds upon	Y7 Rockets - Analyse performance using data collection. Annotate and justify design improvements Y8 RFTL - Analyse performance using data collection. Evaluate and improve designs Y9 Wind Turbines/Dog Tags - Analyse and present production data Y9 Dog Tags - Understand the impact and cost of out of tolerance work in terms of time, energy, materials and money.	Y9 Wind Turbines - Be able to follow the design cycle: Identify problem – Research – Build Prototype – Test – Improve – Present Solutions Y9E Design Process - Be able to research existing designs, improve them and make a prototype. Be able to apply the process to any project Y9F Design Project - Students can follow the engineering design process including feedback from peers and acting on it.	Exam Skills in Autumn Term 1 – carrying out the practise practical exam and evaluate and redesign. A1 Carry out a process A2 Recording the process A3 Interpretation of data B1 Interpretation of a given brief for an engineered product B2 Redesign B3 Evaluation C1 Analysing engineering information associated with the problem C2 Selecting a solution C3 Problem solution	Y9 – Light up sign - Combine production techniques in a single product All years – reference to Engineering careers and local companies	Engineering design process from Autumn Term 2 – including a practice of the assignment (remote control car stand). The engineering design and make process: define the problem, develop possible solutions, choose a solution, design and model the solution, evaluate outcome of project, work in a team.	Engineering design process from Autumn Term 2 – including a practice of the assignment (remote control car stand). The engineering design and make process: define the problem, develop possible solutions, choose a solution, design and model the solution, evaluate outcome of project, work in a team.
	Key vocabulary	Tolerance Trend Anomaly Accuracy Precision Chart Graph Scale Interpret Data Gauge Design Brief Dimension Finish Material Redesign Component Evaluation Justify	Design and Make Process Define Develop Evaluate Peer Review Engineering Brief Aesthetics Function Performance Requirements Research CAD (Computer Aided Design) Sketch Component Assembly Parts List Circuit Diagram Model Prototype	Tolerance Trend Anomaly Accuracy Precision Chart Graph Scale Interpret Data Gauge Design Brief Dimension Finish Material Redesign Component Evaluation Justify	Sector Product Service Nanotechnology Hazard Risk Aerospace Automotive Communications Environmental Transport Rail Marine Global Enterprise SME (Small to Medium Sized Enterprise) Research and Development Manufacturing Service	Design and Make Process Define Develop Evaluate Peer Review Engineering Brief Aesthetics Function Performance Requirements Research CAD (Computer Aided Design) Sketch Component Assembly Parts List Circuit Diagram Model Prototype	Design and Make Process Define Develop Evaluate Peer Review Engineering Brief Aesthetics Function Performance Requirements Research CAD (Computer Aided Design) Sketch Component Assembly Parts List Circuit Diagram Model Prototype
	Development of cultural capital	Understand that data can be represented visually to help support a point or argument and that it can be interpreted in	Understand that there are many different designs for products and they don't all suit each person or situation.	Understand that manufacturing companies use data to sell their products for example car companies provide data for	Understand that large companies such as JLR need smaller companies to supply them with parts and that large	Understand that prototypes, models and preliminary work all have a place in the design process but also in the home	Understand that feedback from peers is useful and not always critical. Everyone is different and sees things differently and

		different ways for example in the daily government briefings for COVID19.	For example if you buy household appliances they are different standards, specifications and costs.	urban driving or 56mph which cannot be achieved in normal conditions because they are done under test conditions with no impediments.	companies often support the local economy indirectly e.g. sandwich shops.	where it is OK to use trial and error to get things to work.	may point out issues that have not previously been noticed. For example an intricate design of a keyring that may snap easily or be too sharp.
	Development of reading	https://www.britannica.com/topic/Big-Ben-clock-London Read the article and create a explanation sheet for children explaining how the clock keeps time.	https://robbreport.com/motors/cars/remote-controlled-car-race-moon-1234586606/ Read the article and write a specification for the car.	https://www.praguepost.com/blog/do-you-know-how-the-filling-machines-work Read the article and answer the comprehension questions.	Can the national grid cope with EV's? - Evolution Solutions Read the source and answer the comprehension questions.	It Took James Dyson 15 Years to Make a Bagless Vacuum | Inc.com Read the source and annotate the diagram of the engineering design process with James Dyson's process from the article.	Who designed Titanic? — Ultimate Titanic Read the source and answer the questions including write a specification for the ship based on the article.
	Concepts –what will students be able to do at the end of the topic	Be able to carry out a practical procedure and record, collect and interpret data in an engineering context. Be able to interpret a design brief and explore design ideas, including their viability as a final solution. Be able to analyse information in an engineering context and will explore how to select a suitable solution and implement it to meet the brief.	Be able to produce solutions to problems using different combinations of engineering skills, including designing as part of the engineering design and make process. Follow the engineering design and make process: define the problem, develop possible solutions, choose a solution, design and model the solution, evaluate outcome of project, work in a team.	Be able to carry out a practical procedure and record, collect and interpret data in an engineering context. Be able to interpret a design brief and explore design ideas, including their viability as a final solution. Be able to analyse information in an engineering context and will explore how to select a suitable solution and implement it to meet the brief.	Be able to examine the interconnection between engineering sectors and engineered products. Be able to examine organisations, functions and job roles, developing their understanding of how these contribute to career progression in engineering.	Be able to produce solutions to problems using different combinations of engineering skills, including designing as part of the engineering design and make process. Follow the engineering design and make process: define the problem, develop possible solutions, choose a solution, design and model the solution, evaluate outcome of project, work in a team.	Be able to produce solutions to problems using different combinations of engineering skills, including designing as part of the engineering design and make process. Follow the engineering design and make process: define the problem, develop possible solutions, choose a solution, design and model the solution, evaluate outcome of project, work in a team.
Year Group		**Autumn Term 1**	**Autumn Term 2**	**Spring Term 1**	**Spring Term 2**	**Summer Term 1**	**Summer Term 2**
Year 11	**Topic**	Materials and Processes (C2A) 3 pin plug	Disassembly (C2B) Bicycle Multi-tool	Production Plans (C2C) Manufacture of the Multi-tool Spanner	Production Plans (C2C) Manufacture of the Multi-tool Spanner		
	Core knowledge from this topic	Learning aim A: Understand materials, components and processes for a given engineered product Learners will investigate the materials, components and processes used in the production of engineered products. A1 Materials A2 Components A3 Processes	Learning aim B: Investigate a given engineered product using disassembly techniques Learners will investigate engineered products by using practical engineering skills and techniques, such as disassembly and assembly, observation and measurement. B1 Practical engineering skills B2 Disassembly techniques B3 Product design specification (PDS)	Learning aim C: Plan the manufacture of and safely reproduce/inspect/test a given engineered component Learners will produce solutions to problems using different combinations of practical engineering skills, including making as part of the engineering design and make process. C1 Engineering make process C2 Develop a production plan	Learning aim C: Plan the manufacture of and safely reproduce/inspect/test a given engineered component Learners will produce solutions to problems using different combinations of practical engineering skills, including making as part of the engineering design and make process. C1 Engineering make process C2 Develop a production plan		
	Links to the national curriculum (if applicable)	BTEC Tech Award in Engineering Level 1/2 Component 2 Learning Aims 2A	BTEC Tech Award in Engineering Level 1/2 Component 2 Learning Aims 2B	BTEC Tech Award in Engineering Level 1/2 Component 2 Learning Aims 2C	BTEC Tech Award in Engineering Level 1/2 Component 2 Learning Aims 2C	NA	NA
	Previous content that this topic builds upon	Y7 Materials – polymers Y8 Materials – Fabrics and Wood Y9 Materials – Metals	Y9 Dog Tags - Inspection techniques All years – Specifications and designing to meet them	Y9 Dog Tags - Inspection techniques and writing production plans	Y9 Dog Tags - Inspection techniques and writing production plans		

Engineering and STEM Curriculum Overview Plan

		All years – processes used in lessons		All years – use of workshop tools and processes	All years – use of workshop tools and processes		
	Key vocabulary	Ferrous Non-ferrous Thermosetting polymer Thermoforming polymer Malleability Ductility Alloy Galvanising Electroplating Recycling Proprietary Component Product Specific Fasteners Shaping Turning Milling Cutting Joining Forming	Thread Measurement Disassembly PPE (personal protective equipment) Risk Assessment Product Design Specification (PDS) Size Mass SI units Product Life Reliability Performance Service Requirements Economic Standards Legislation	Engineer's Blue Tolerances Micrometer Vernier Callipers Operations Processes Materials Health and Safety Inspection Quality Standards Risk Hazard Quality Control	Engineer's Blue Tolerances Micrometer Vernier Callipers Operations Processes Materials Health and Safety Inspection Quality Standards Risk Hazard Quality Control		
	Development of cultural capital	Understand the different polymers available and their properties and the importance of selecting appropriate materials for example an item that may become hot needs to be made from thermosetting polymer and not thermoforming.	Understand that products that are sold in the UK must perform as they are advertised under the sale of good act. For example, when buying goods from abroad that are imported.	Understand that products can be fixed and do not need to be thrown away. Refer to the "right to repair" law which should extend the life by of products by up to 10 years.	Understand that production of items needs to be planned so that resources are not tied up in stock. This is called JIT – just in time and is used by large manufacturers for Toyota – who call it the TPS (Toyota Production System).		
	Development of reading	The history of electric power supply in London (metadyne.co.uk) Read the source and complete the table to complete the early electricity supply to the current system.	Meet the inspiring woman who cycled around the world in 125 days - Lonely Planet Read the source and answer the comprehension questions.	Big Bertha's Two-Mile Subterranean Journey Is Almost Over (popularmechanics.com) Read the source and describe the operation and maintenance of Bertha.	NASA Ingenuity Mars Helicopter Prepares for First Flight – NASA's Mars Exploration Program Read the source and then write the plan (using the timescale in sols) to deploy Ingenuity.		
	Concepts –what will students be able to do at the end of the topic	Be able to investigate the materials, components and processes used in the production of engineered products.	Be able to investigate engineered products by using practical engineering skills and techniques, such as disassembly and assembly, observation and measurement. Be able to write a product design specification (PDS) for an engineered product.	Be able to plan the manufacture of and safely reproduce/inspect/test a given engineered component. Be able to produce solutions to problems using different combinations of practical engineering skills, including making as part of the engineering design and make process.	Be able to plan the manufacture of and safely reproduce/inspect/test a given engineered component. Be able to produce solutions to problems using different combinations of practical engineering skills, including making as part of the engineering design and make process.		