BTEC Tech Award Engineering Level 2
Curriculum Intent 2023-2024

Our curriculum at Brine Leas strives to present a range of opportunities for students to develop their breadth and depth of technical skills and knowledge. The students can then apply these along with scientific principles and mathematical skills to project-based problems and theoretical scenarios, establishing good habits of learning which encourage life-long learning. Students develop practical and technical skills as they design and make prototypes and products that solve real life problems within a variety of contexts, considering both the needs, wants and values of themselves and others. We will encourage students to take risks in their design approaches and aim to develop resourceful, innovative and enterprising young learners who can go on to be the next generation of engineers and practitioners. We deliver life skills, engineering skills, health and safety, teamwork, facilitated learning, confidence, workshop skills, Computer Aided Design and Computer Aided Manufacture, management skills, working independently. We have fantastic facilities with engineering machinery that mirrors industry. The core skills of English, Maths and Sciences are applied to engineering problem solving, designing and building. The specification covers modern engineering technologies, materials and processes, and established engineering practices. The 'hands on' project-based areas of this course provide challenging opportunities for personal development and opportunities for the academic learning to be seen and experienced as applied to a real situation. Completing this Engineering course provides advantageous preparation for students wishing to undertake further Engineering or technology-based education at KS5 and also provides experience and knowledge sought by employers in the industrial engineering community.

Students taking this course are exposed to a wide range of engineering processes including Computer Aided Design, machining, heat treatment, welding, fabrication and electronic circuits. Technically minded students will be inspired by these experiences and motivated to develop and apply their gained engineering knowledge during the major project task. Most pupils experience a massive sense of achievement as they complete the project and look back at their journey over the designing and engineering of a product and on their personal development.

The Vocational Award in Engineering has been designed to support learners in schools and colleges who want to learn about this vocational sector and the potential it can offer them for their careers or further study. This further study would provide learners with the opportunity to develop a range of specialist and general skills that would support their progression to employment.

Trips & visits

Not applicable

Assessment

The following units will be delivered and assessed. Units 1 and 2 are based on an assignment brief will be provided by WJEC that will include a scenario and several tasks.
Unit 3 questions requiring objective responses, short and extended answers, based around applied situations. Students will be required to use stimulus material to respond to questions.

Unit	Title	Assessment
1	Manufacturing Engineering Products Controlled assessment	20 hours 40% of qualification 80 marks
2	Designing Engineering Products Controlled assessment	10 hours 20% of qualification 40 marks
3	Solving Engineering Problems Written examination	1 hour 30 minutes 40% of qualification 80 marks

Below are the assessment objectives for this specification. Students must:

AO1 Demonstrate knowledge and understanding from across the specification.
AO2 Apply skills (including practical skills), knowledge and understanding in a variety of contexts and in planning and carrying out investigations and tasks.
AO3 Analyse and evaluate information, making reasoned judgements and presenting conclusions.

Homework

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Students are set homework to reinforce and practice the learning completed during lessons and to prepare for the external examination. Homework will be set fortnightly. Students are also expected to complete their portfolio tasks based on the units they are working on.

Clubs and/or intervention

Students are welcome to attend extra-curricular sessions, to make use of the workshop facilities, computers and CNC machines.

Parental/Carer support

Monitor progress and encourage the completion of the unit portfolio. Encourage the watching of 'how it's made', 'Forged in Fire', 'Mega Engineering' type of programs.

Helpful sources of information

The intranet contains various files and documents to assist with completion of this course and is available via the school computers and also from any internet linked home computers via the portal.

Useful websites:

https://www.heta.co.uk/
http://www.ceata.co.uk/
https://www.raf.mod.uk/
https://www.bbceng.info/
www.technologystudent.com

Connections to future pathways

Careers: mechanical technician, maintenance technician, mechanical engineer, production engineer, automotive engineer, maintenance engineer, design engineer, structural engineer, ergonomics adviser, test engineer, production engineer, product designer, industrial designer, materials laboratory technician, production planner, quality inspector, quality engineer, crash test investigator, welding and fabrication technician, CNC Operative, health & safety officer

Future learning: Level 3 BTEC National in Engineering, Technical certificate in Engineering, General Engineering, Product Design A-level

Degrees, including: Engineering, Product Design, Physics, Maths

Year 10 Overview

Term	Knowledge	Assessment	Connections to learning

Autumn 1	What is Engineering? It is vital for students to develop their knowledge of what engineering is about in order for them to make informed decisions for their future position within the national and global economy. The UK is aiming to develop a new smart style of engineering for which engineers are needed, and the country is short of engineers. Engineering covers a wide range of disciplines that will enable students to apply their mathematical, scientific and engineering skills to real-life problems.		
	Students should have increasing confidence in the knowledge required to perform the following: ➢ Read and understand orthographic drawings. E.g. the conventions of dimensioning and tolerances. ➢ Measuring and marking out methods. ➢ Turning, using manual or CNC lathe. ➢ Cutting using hand tools. ➢ Drilling, using both pillar drill and lathe, Using a jig Know how to calculate Areas, Volumes for a range of 2D and 3D complex shapes. Know how to calculate Density	➢ Application of skills through completion of set practical tasks. ➢ Application of knowledge through written short answer questions and completion of set drawing exercises. ➢ Examination style written questions.	Prior learning in D&T (Y7-9) ➢ Templates and drawings to follow and create. ➢ Manufacture of products ➢ Evaluation of outcomes ➢ Future learning in Engineering ➢ Read an engineering drawing when responding to an engineering brief (Y11) Prior learning in D&T (Y7-9) ➢ Manufacture of products ➢ Evaluation of outcomes Future learning in Engineering ➢ Read an engineering drawing when responding to an engineering brief (Y11)

Autumn 2	**What is it made of?** sing the right materials in particular applications is a key factor to the success of most engineering projects. Students should have nowledge and understanding of the following groups/classifications of engineering materials. Students should be able to identify mmon materials based on their physical appearances and the following properties: oughness/brittleness ductility malleability ardness trength and stiffness. udents should also be able to demonstrate knowledge and understanding of the behavioural characteristics of materials during handling/machining. Pupils should also be able to identify the environmental impact of using different materials and understand the moral dilemmas of selecting different materials for a particular purpose.		
	Students should have increasing confidence in the knowledge required to perform the following: ➢ Bending and forming sheet metal and small bar. ➢ Material hardness testing ➢ Hot working/forging case hardening. Students should have knowledge of example local and national companies who utilise the above processes.	➢ Application of knowledge through a mixture of short and long answer written questions, design challenges and production of technical drawings, ➢ Application of skills through completion of set practical tasks. ➢ Comparison of test results and summarising conclusions.	Future learning in Engineering ➢ Creating a specification when responding to an engineering brief (Y11) **1 Personal development** - use of software, hardware and equipment, organisation, interpersonal skills. **6 Cultural development –** awareness of examples of engineering companies

Spring 1	**Standard Materials and processes** It is ok to have a brilliant idea, but if it needs to be made of a material or via a process which is not available, then it may cost more or take longer to make than the idea is worth. If it can be made from standard materials and via standard processes, then the idea can be quickly realised. Students should have knowledge and understanding of the cost, availability, form and supply of common engineering materials, and be familiar with the capabilities of commonly used engineering processes.		
	Students should have increasing confidence in the knowledge required to perform the following: ➢ Shaping and finishing, filing, milling, use of abrasives ➢ Following a provided production plan ➢ Awareness of health and safety. Using PPE and conducting risk assessments. ➢ Adhere to workshop safety. Procedures. Know how to calculate using: ➢ metric units and standard form ➢ Ohm's law and resistance	➢ Application of knowledge through written short answer questions and production of technical drawings, ➢ Application of skills through completion of set practical tasks. Examination style written questions.	Future learning in Engineering ➢ Creating a Production plan and risk assessments when responding to an engineering brief (Y11) Prior learning in D&T (Y7-9) ➢ Measuring during manufacture of products Future learning in Engineering ➢ A Level and Vocational Engineering based subjects contain an substantial mathematical content (Y11) **1 Personal development** - use of software, hardware and equipment, application of mathematical principles. **6 Cultural development –** Evaluating the cost of

			ensuring safety in the work place, comparing to other cultures who do not provide safe working conditions.
Spring 2	**Unit 1 Manufacturing Engineering Products.** Unit 1 provides learners with the opportunity to interpret different types of engineering information in order to plan how to manufacture engineering products. Learners will develop knowledge, understanding and skills in using a range of engineering tools and equipment in order to manufacture and test an end product These skills form a basic foundation for an engineer in any of the vast array of engineering specialisms.		
	Learners should be able to understand engineering drawings, and identify parts and/or components that will enable them to plan a final manufactured product, and should be able to: ➢ interpret standard engineering symbols, such as: ➢ diameter ➢ radius ➢ surface ➢ angle ➢ offset ➢ Tolerances ➢ read information, such as: ➢ third angle projection ➢ isometric views ➢ exploded views ➢ sectional views ➢ orthographic projection ➢ detail views ➢ interpret drawings to obtain information on: ➢ finishes ➢ title blocks	Internally assessed Practical outcome and portfolio The total time allocated for assessed tasks is 20 hours. Candidates cannot exceed this time. Unit 1 tasks feature recommended timings that are for guidance only. Hand in date for the Practical outcome and portfolio is end of April.	Future learning in Engineering ➢ Virtually all avenues of engineering disciplines involve being able to communicate via engineering drawings. ➢ During A Level or Vocational courses, when selecting replacement parts engineers need to verify that replacement parts are to the original specification. **1 Personal development** - use of software, hardware and equipment, application of mathematical principles. **6 Cultural development –** Evaluating the cost of

	➢ calculations (linear dimensions and dimensions from a datum) ➢ understand sketches, such as: ➢ simple sketches giving clarification or information on construction details ➢ sketched engineering drawings of the manufactured parts produced to recognised standards ➢ interpret specific requirements provided in a manufacturing specification. Learners should be able to interpret key engineering information about manufacturing requirements from: ➢ data sheets, providing information such as feed and speed rates, tapping drill sizes, and finishes ➢ job sheets, including information about basic details of the parts to be made such as quantity, equipment, and tooling ➢ specifications, including specific requirements of the proposed engineered product ➢ tolerances, providing: ➢ acceptable levels of accuracy for individual parts ➢ justifications for errors and suggestions to overcome identified problems. Learners should be able to present engineering information they have extracted from drawings etc., such as: ➢ drilling speeds ➢ cutting speeds for correct materials ➢ tapping drill sizes ➢ finishing details ➢ tolerances ➢ component details such as	Application of knowledge through written short answer questions and production of technical drawings, Application of knowledge through written short answer questions and production of technical drawings,	ensuring safety in the work place, comparing to other cultures who do not provide safe working conditions. Understanding the effect of high automation in the manufacturing sector on the job market.

	➢ washers ➢ nuts & bolts ➢ set screws ➢ machine screws	Application of knowledge through written short answer questions and production of technical drawings, Application of skills through completion of set practical tasks.	Future learning in Engineering
	Learners should be able to identify which materials are suitable for manufacturing specific parts of an engineering product and present the information in planning documentation. Learners should be aware of material stock and stock sizes. Learners should be able to identify and select the equipment that is needed for each stage of the manufacture of a product: ➢ centre lathe ➢ drills ➢ milling machine ➢ laser cutter ➢ bandsaw ➢ linishers ➢ brazing hearth ➢ welding equipment ➢ buffer/polisher ➢ sheet metal bender	➢ Application of knowledge through written short answer questions and production of technical drawings, ➢ Application of skills through completion of set practical tasks.	➢ Virtually all avenues of engineering disciplines involve being able to communicate via engineering drawings. ➢ During A Level or Vocational courses, when selecting replacement parts engineers need to verify that replacement parts are to the original specification.
	using technical details given in an engineering drawing and any other supporting details. Learners should be able to identify the tools that are needed for each stage of the manufacture of a product: ➢ scriber ➢ centre punch ➢ callipers	Application of knowledge through written short answer questions and production of technical drawings, Application of skills through completion of set practical tasks.	Future learning in Engineering ➢ Virtually all avenues of engineering disciplines involve being able to communicate via engineering drawings. ➢ During A Level or Vocational courses, when selecting replacement parts engineers need to

	➢ standard ➢ internal ➢ external ➢ odd leg ➢ soldering iron ➢ steel rule ➢ engineers square ➢ file ➢ dividers ➢ micrometre ➢ Vernier callipers ➢ rivet sets ➢ taps and dies ➢ hacksaw ➢ fret saw ➢ former ➢ pliers Learners should be able to present their plan of processes, sequencing, equipment, and tool/machine requirements in planning documentation such as: ➢ job sheets ➢ planning tables. Learners should be able to sequence manufacturing stages appropriately and present the information in planning documentation demonstrating that they are able to: ➢ prioritise activities ➢ order the manufacturing stages appropriately ➢ identify parameters relating to: ➢ tolerances ➢ finishes. Learners should be able to identify time requirements for processing resources in	Application of knowledge through written plan of manufacture.	verify that replacement parts are to the original specification. Prior learning in D&T (Y7-9) ➢ Selecting basic tools during manufacture of products Future learning in Engineering ➢ During A Level or Vocational courses, selecting and understanding processes. Prior learning in D&T (Y7-9) ➢ Selecting basic tools during manufacture of products

	preparation for manufacture and the time needed for each stage. Learners should be able to present this information in a way that would allow a third party to manufacture the product. Learners should be able to demonstrate safe working practice with a range of engineering tools, such as: ➢ file ➢ scriber ➢ centre punch ➢ tap and die ➢ vice ➢ hacksaw ➢ rivet gun and set ➢ engineers square ➢ callipers ➢ Vernier callipers ➢ micrometres ➢ Pliers ➢ Shears ➢ Reamer ➢ Gauge ➢ screwdriver ➢ de-burring tool. arners should also be aware that tools (tooling) n include specific parts associated with items of uipment in an engineering workshop such as: ➢ lathe tools: ➢ knurling tool ➢ cranked turning tool ➢ parting tool ➢ tool holder/tool post ➢ boring bar ➢ chuck ➢ hand turning tools – types and uses	Application of knowledge through written plan of manufacture. Application of skills through completion of set practical tasks. Application of knowledge through written time plan and gant-chart. Application of knowledge through written plan of manufacture.	Future learning in Engineering ➢ During A Level or Vocational courses, selecting and understanding processes. ➢ During A Level or Vocational courses, planning, selecting and understanding processes. ➢ During KS3 pupils have experienced creating a diary of making and had to make decisions on the order of making

	➢ portable power tools – driver selection, speed and torque settings, charging. Learners should able to demonstrate safe working practice with a range of engineering equipment such as: ➢ centre lathes: ➢ turning ➢ facing off ➢ taper turning ➢ knurling ➢ boring ➢ drilling ➢ thread cutting ➢ drilling machines – including a range of drill types and trimming tools ➢ milling machines: ➢ slot milling ➢ end milling ➢ mill types ➢ multimeters - reading values including: ➢ voltage ➢ amps ➢ Ohms/resistance ➢ checking continuity ➢ UV PCB light box ➢ PCB tank ➢ laser cutters ➢ vacuum former. Learners should be able to follow appropriate health and safety procedures when working in engineering workshops by: ➢ assessing potential risks ➢ deciding what control measures are necessary	Application of skills through completion of set practical tasks. Regular visual monitoring of pupils to ensure safety rules are understood and being followed. Application of skills through completion of set practical tasks.	Limited planning experience during KS3 during project making. Safe working practices should be established during KS3 and will be required in any future civilised work place.

	➢ identifying personal protective equipment (PPE) needed for specific tasks. Learners should be able to apply a range of key engineering processes used in manufacture, such as: ➢ marking out ➢ cutting ➢ finishing ➢ preparing ➢ shaping ➢ drilling ➢ milling ➢ turning ➢ brazing ➢ joining ➢ filing ➢ soldering ➢ forming. Learners should know and understand which manufacturing processes and tools are appropriate for different material, including: ➢ metals ➢ non-metals: ➢ plastics ➢ composites ➢ woods ➢ resins. Learners should know and understand that successful engineering outcomes require measuring against given criteria: ➢ inspection techniques ➢ against success criteria ➢ against engineering information ➢ tolerance ➢ quality inspection.	Application of skills through completion of verbal and written risk assessments and completion of practical tasks. pplication of knowledge through written short answer questions. Application of skills through completion of set practical tasks. pplication of knowledge through written short answer. pplication of knowledge through written product inspection sheets and product and process evaluation. Questions.	Future learning in Engineering ➢ Virtually all avenues of engineering disciplines involve being able to

	Learners should be able to evaluate their own practices and processes during the planning and manufacturing of engineering products or parts of engineering products.	Measurements taken of outcomes and marked on to engineering drawings, physical check of results for accuracy.	communicate via engineering drawings. ➢ During A Level or Vocational courses, when selecting replacement parts engineers need to verify that replacement parts are to the original specification.
Summer 1	Unit 2 Virtually everything that we interact with from day to day has been through the design process. This unit allows learners to understand how an engineering design process is used to develop or adapt products, and how these solutions help to meet the needs and demands of clients, users and environments. In this unit, learners will become familiar with developing problem-solving skills based on real problems and identified market needs. They will need to analyse a brief and specification and produce a solution that meets those requirements. This unit allows learners to experience and gain understanding of how an engineered product is adapted and improved over time. It also provides learners with the opportunity to consider the ethical dilemmas faced by modern design engineers, e.g. designed 'planned obsolescence' verses long term environmental impact.		
	Learners should be able to identify primary features of the product, such as: ➢ electrical components: ➢ connections ➢ LEDs ➢ resistors ➢ fuses ➢ diodes ➢ power supplies ➢ mechanical components: ➢ fixings (nuts, bolts, washers, etc) ➢ clamping devices ➢ adjusting mechanisms ➢ properties of component materials: ➢ conductivity ➢ friction ➢ durability	pplication of knowledge through written short answer questions and based on technical drawings interpretation. ➢ Application of skills through completion of set practical tasks.	Future learning in Engineering Creating a specification when responding to an engineering brief (Y11) **1 Personal development –** 3D visualisation. Use of software, hardware and equipment, application of mathematical principles. **5 Moral development –** Evaluating sustainability and the environmental

	➢ quality. Learners should be aware of features of other engineered products that may have similar needs to their given brief such as: ➢ aesthetics ➢ user/customer/client needs ➢ safety ➢ ergonomics ➢ anthropometrics ➢ mechanisms ➢ electronics ➢ sustainability ➢ material properties: ➢ hardness ➢ toughness ➢ malleability ➢ brittleness. Learners should be aware of why and how these features are applied on other similar products. Learners should be able to explain the functional properties of their design solutions focusing on areas, such as: ➢ mechanical function ➢ electrical function ➢ how components interrelate with one another.	Completion of existing product research and evaluation. Completion of written descriptions of metal properties. Completion of product specification with justification. Detailed annotation on design proposals.	impact of different design decisions.

Summer 2	Unit 2 Virtually everything that we interact with from day to day has been through the design process. This unit allows learners to understand how an engineering design process is used to develop or adapt products, and how these solutions help to meet the needs and demands of clients, users and environments. In this unit, learners will become familiar with developing problem-solving skills based on real problems and identified market needs. They will need to analyse a brief and specification and produce a solution that meets those requirements. This unit allows learners to experience and gain understanding of how an engineered product is adapted and improved over time. It also provides learners with the opportunity to consider the ethical dilemmas faced by modern design engineers, e.g. designed 'planned obsolescence' verses long term environmental impact.		
	Learners should be able to: ➢ identify existing solutions already available that meet or partly meet ➢ the problem of the brief ➢ generate ideas related to the engineered solution ➢ generate a range of solutions that meet the given brief and address ➢ the problem set ➢ explore implementation of ideas. Learners should be able to develop a range of ideas through to a solution including testing and modelling. Learners should be aware that design solutions must meet a range of specific criteria, including any limitations set by the brief such as those relating to: ➢ materials ➢ sizes	Completion of existing product research and evaluation. Completion of annotated sketches, drawings and CAD models. Production of rapid modelling and testing.	Future learning in Engineering ➢ Designing a product when responding to an engineering brief (Y11) **1 Personal development –** 3D visualisation. Use of software, hardware and equipment, application of mathematical principles. **5 Moral development –** Evaluating sustainability and the environmental impact of different design decisions.

	➢ tolerances ➢ cost ➢ operational parameters Learners should determine the most suitable engineering solution by using a suitable evaluative method such as: ➢ a SWOT analysis ➢ a review/evaluation against the given design specification ➢ a review/evaluation against the brief. Learners should be able to communicate design ideas in a suitable media appropriate to the information being presented. This should: ➢ convey meaning ➢ use appropriate language ➢ have a logical structure ➢ clearly present the information using either ICT or traditional handwritten/ ➢ illustration methods ➢ use appropriate terminology ➢ include visual support such as simple models, CAD visuals or test rigs.	Completion of own design project assessed against criteria.	

Year 11 Overview
BTEC Level 1/2 Tech Award Engineering

Term	Knowledge	Assessment	Connections to learning
	Unit 2 Specification Virtually everything that we interact with from day to day has been through the design process. This unit allows learners to understand how an engineering design process is used to develop or adapt products, and how these solutions help to meet the needs and demands of clients, users and environments. In this unit, learners will become familiar with developing problem-solving skills based on real problems and identified market needs. They will need to analyse a brief and specification and produce a solution that meets those requirements.		

	This unit allows learners to experience and gain understanding of how an engineered product is adapted and improved over time. It also provides learners with the opportunity to consider the ethical dilemmas faced by modern design engineers, e.g. designed 'planned obsolescence' verses long term environmental impact.		
Autumn 1	Learners should be able to produce a manufacturing specification that includes: ➢ precise details of manufacturing requirements, presented in textual ➢ form, and/or included on drawings ➢ specification points that must be interpreted before manufacturing ➢ work commences, such as: ➢ materials information ➢ technical details ➢ finishing details.	Completion of own design project, specification assessed against criteria.	Application of learning completed during Y10 **5 Moral development –** Evaluating sustainability and the environmental impact of different design decisions.
Autumn 2	Unit 2 Drawings Virtually everything that we interact with from day to day has been through the design process. This unit allows learners to understand how an engineering design process is used to develop or adapt products, and how these solutions help to meet the needs and demands of clients, users and environments. In this unit, learners will become familiar with developing problem-solving skills based on real problems and identified market needs. They will need to analyse a brief and specification and produce a solution that meets those requirements. This unit allows learners to experience and gain understanding of how an engineered product is adapted and improved over time.		
	Learners should be able to produce engineering drawings, using traditional instruments or CAD based software, of a final proposed engineered product to recognised standards including: ➢ a 3rd angle orthographic projection ➢ an isometric image. Learners should be able to produce engineering drawings that include: ➢ dimensions and associated symbols ➢ diameter, circumference, radius, height, depth, width ➢ conventions ➢ title block ➢ dimension lines ➢ extension lines	➢ Application of knowledge through examination style questions.	Application of learning completed during Y10 **1 Personal development –** 3D visualisation. Use of software, hardware and equipment, application of mathematical principles

	➢ centre lines ➢ metric units of measurement ➢ hidden detail ➢ scale.		
Spring 1	Unit 3 Examination Preparation Understanding engineering materials and processes is key to understanding the core principle of Engineering, and fundamental to an engineer's role is finding functional solutions to problems and demands. However, many areas in Engineering are fast evolving, and developments in materials, processes and technologies are constantly re-shaping the sector. This unit considers both the steadfast central tenets of modern Engineering, whilst exploring the social and cultural impacts of engineering developments and achievements in the home and in society in general.		
Spring 1	Describing engineering developments Learners should know and understand how engineering developments have an impact on the design of products and structures. These include developments in: ➢ structural design, focusing on the development of bicycles ➢ mechanical design, focusing on the development of theme park ➢ rides ➢ electronic design, focusing on the development of mobile ➢ phone/smart technology. Explaining the effects of engineering achievements Learners should know and understand how the development of engineering products are impacted by changes in: ➢ materials ➢ smart technologies, including voice activated, Bluetooth and Wi-Fi ➢ electronic and micro-electronic components	➢ Application of knowledge through examination style questions. ➢ Application of knowledge through examination style questions. ➢ Application of knowledge through examination style questions.	Application of learning completed during Y10 **1 Personal development –** 3D visualisation. Use of software, hardware and equipment, application of mathematical principles. **5 Moral development –** Evaluating sustainability and the environmental impact of different design decisions and different technologies.

	➢ and have affected modern life, including: ➢ in the home ➢ in society. Explaining how environmental issues affect engineering applications Learners should know and understand how the manufacture and use of engineered products have an environmental impact in terms of: ➢ materials development ➢ costs ➢ transportation ➢ their use ➢ their disposal ➢ recycling ➢ sustainability. ➢ Learners should know and understand how environmental issues ➢ affect: ➢ engineering processes ➢ engineering products. Understanding materials, their properties, and their selection for specific purposes Learners should know and understand the following materials and their properties, and when they should be used for a specific purpose. ➢ Ferrous, e.g. mild steel, stainless steel, tool steel		

	➢ non-ferrous, e.g. brass, copper, aluminium ➢ thermoplastics, e.g. acrylic, nylon, HIPS ➢ thermosetting plastics, e.g. urea formaldehyde, silicon ➢ smart, e.g. thermochromic pigments/inks, shape memory alloy, ➢ nitinol wire ➢ composite, e.g. carbon fibre, Kevlar. Describe properties required of materials for engineering products Learners should know and understand the physical properties of materials, including their: ➢ tensile strength ➢ compressive strength ➢ hardness ➢ toughness ➢ malleability ➢ ductility ➢ conductivity ➢ corrosive resistance ➢ environmental degradation ➢ elasticity and how they can be applied in an engineering context. Learners should know and understand the properties needed for the following engineering products: ➢ mobile phones ➢ security alarm found in the home ➢ bicycles ➢ children's play areas.		

Spring 2	Unit 3 Examination Preparation Understanding engineering materials and processes is key to understanding the core principle of Engineering, and fundamental to an engineer's role is finding functional solutions to problems and demands. However, many areas in Engineering are fast evolving, and developments in materials, processes and technologies are constantly re-shaping the sector. This unit considers both the steadfast central tenets of modern Engineering, whilst exploring the impact of engineering developments and achievements in the home and in society in general.		
	Explaining how materials are tested for properties Learners should know and understand how destructive and non-destructive testing is undertaken to determine physical properties of engineering materials, including: ➢ tensile strength ➢ hardness ➢ toughness ➢ malleability ➢ ductility ➢ conductivity ➢ elasticity. Describing engineering processes Learners should understand processes, including relevant tools and equipment, used to manufacture engineering products including: ➢ marking out ➢ cutting ➢ finishing ➢ preparing ➢ shaping ➢ drilling ➢ turning ➢ brazing ➢ joining – permanent and temporary fixings ➢ filing	➢ A Application of knowledge through examination style questions. ➢ Application of knowledge through examination style questions.	Application of learning completed during Y10 **1 Personal development –** 3D visualisation. Use of software, hardware and equipment, application of mathematical principles. **5 Moral development –** Evaluating sustainability and the environmental impact of different design decisions and different technologies.

	➢ soldering. Describing applications of engineering processes Learners should understand how engineering processes can be used for: ➢ material removal ➢ shaping and manipulation ➢ joining and assembly ➢ heat and chemical treatment. Safe working practices Learners should know and understand how to work safely when working in an engineering environment such as a school/college workshop when preparing, using and finishing materials, including by: ➢ carrying out a risk assessment ➢ identifying risks ➢ identifying appropriate control measures.	➢ Application of knowledge through examination style questions.	
Summer 1	Unit 3 Examination Revision Understanding engineering materials and processes is key to understanding the core principle of Engineering, and fundamental to an engineer's role is finding functional solutions to problems and demands. However, many areas in Engineering are fast evolving, and developments in materials, processes and technologies are constantly re-shaping the sector. This unit considers both the steadfast central tenets of modern Engineering, whilst exploring the impact of engineering developments and achievements in the home and in society in general.		
	Using mathematical techniques for solving engineering problems	➢ Application of knowledge through examination style questions, and past examination papers. ➢ Final external examination.	➢ Topics cross over with KS3 and 4 physics. **1 Personal development –** 3D visualisation. Use of

	Learners should know and understand and be able to use calculations and mathematical techniques that are required to solve engineering problems, including: ➢ use of formulae ➢ Ohms law ➢ mechanical advantage ➢ velocity ratio ➢ areas and volumes ➢ measuring using datums ➢ estimation (of cost/materials) ➢ average ➢ scale (enlargement and reduction) ➢ units of measurement including: ➢ metric (e.g. metres, millimetres) ➢ imperial (e.g. pounds, pence)• time conversion ➢ (hours, minutes & seconds) ➢ graphs – histogram, bar charts, line graph, pie charts. Understanding and producing engineering drawings Learners should understand the following technical details in an engineering drawing: ➢ section views ➢ construction lines ➢ centre lines ➢ hidden details ➢ standard conventions ➢ datums. Learners should be able to interpret and produce a range of engineering drawings including: ➢ third-angle orthographic projections	➢ Application of knowledge through examination style questions, and past examination papers. Final external examination	software, hardware and equipment, application of mathematical principles. **5 Moral development –** Evaluating sustainability and the environmental impact of different design decisions and different technologies. Essential part of KS4 Engineering. Almost all sectors of engineering use engineering drawings as a fundamental method of communication.

	➢ isometric views ➢ sectional views ➢ that include technical details such as: ➢ dimension lines ➢ sectional lines. ➢ Examination via sample examination papers.		