KS5 A Level Engineering Curriculum Mapping

Engineering Y12						
Term	**Autumn (1)**	**Autumn (2)**	**Spring (1)**	**Spring (2)**	**Summer (1)**	**Summer (2)**
Topic(s)/ Subjects(s)	Materials and properties Structures	Modelling/prototyping Electronics	Metals plastics practical Control systems	Timber Practical's Mechanisms	Exam Theory	Coursework research section.
Knowledge and skills (Content)	i. sourcing and processing raw materials into a workable form ii. the disposal of waste, surplus materials and components, by-products of production including pollution related to energy iii. cost implications related to materials and process. Learners should understand processes that can be used to ensure the structural integrity of a product, such as: -triangulation -reinforcing. Demonstrate an understanding of static and dynamic forces in structures and how to achieve rigidity, including: -tension, compression, torsion and bending. -stress, strain and elasticity -mass and weight	i. planning for accuracy and efficiency through testing and prototyping ii. being aware of issues in relation to different scales of production iii. designing for repair and maintenance iv. designing with consideration of product life. Demonstrate an understanding of the basic principles of electricity, including: -voltage -current -Ohm's law -power. Demonstrate an understanding of the function of an overall system, referring to aspects including: -passive components: resistors, capacitors, diodes - inputs: sensors for position, light, temperature, sound, infra-red, force, rotation and angle	Understand that most products consist of multiple materials and that design engineers are required to discriminate between them appropriately for their use, including: i. ferrous, non-ferrous and alloy metals, such as: o mild steel, aluminium and brass. ii. thermo softening and thermosetting polymers, such as: o HIPS, ABS and polyester resin, epoxy resin and polyimides. iii. timbers and manufactured boards, such as: o oak, plywood and MDF. iv. textiles used for reinforcement and coverings, such as: o geotextiles used in civil engineering and construction. v. composite materials, such as: o fibre-reinforced plastics,	• cost effective distribution • environmental issues and energy requirements • social media and mobile technology • global production and delivery. Demonstrate an understanding of the functions that mechanical devices offer to products, providing different types of motion, including: -rotary -Linear -reciprocating -oscillating. Demonstrate an understanding of devices and systems that are used to change the magnitude and direction of forces and torques, including: -gears, cams, pulleys and belts, levers, linkages, screw threads, worm	Awareness of different strategies, techniques and approaches to explore, create and evaluate design ideas, including: • iterative designing • user-centred design • circular economy • systems thinking.	• user-centred design and stakeholder analysis • SWOT analysis • focus groups • qualitative observations • market research to identify gaps for new products or opportunities to update existing products.

	-rigidity -modes of failure.	-process control: programmable microcontroller -signal amplification: MOSFET, driver ICs -outputs: LED, sounder, solenoid, DC motor, servo motor, stepper motor, piezo actuator, displays -analogue and digital signals and conversion between them -open and closed loop systems including feedback in a system and how it affects the overall performance -sub-systems and systems thinking	glass-reinforced plastics (GRP) and carbon fibre (CFRP). vi. smart materials, such as: o shape memory alloy, motion control gel, self-healing materials, thermochromic, photochromic and electrochromic materials. vii. modern materials, such as: o sandwich panels, e-textiles, rare earth magnets, high performance alloys and super-alloys, graphene and carbon nanotubes. Demonstrate an understanding of how electronic systems provide input, control and output process functions. -switches and sensors, to produce signals in response to a variety of inputs - programmable control devices -signal amplification - devices to produce a variety of outputs including light, sound, motion.	drives, sprockets, chain drives and belt drives -epicyclic gear systems -bearings and lubrication -efficiency in mechanical system		

			Demonstrate an understanding of how programmable devices are used to add functionality to products, relating to coding of and specific applications of programmable components, such as: - how they incorporate enhanced features that can improve the user experience and solve problems in system design - how they use basic techniques for measuring, controlling, storing data and displaying information in practical situations -electronic prototyping platforms and integrated development environments (IDE) for simulation in virtual environments -the use of programmable components and microcontrollers found in products and systems, such as robotic arms or cars			

			- creating flowcharts to describe processes and decisions within a process to control input and output components			
Assessment	End of project assessment exam questions	End of project assessment exam questions	End of project assessment exam questions	End of project assessment exam questions		
Cross Curricular Links	Links with science and industry protocols.	Links with Art, Math's and IT.	Links with geography, Math's and IT	Links with Math's, English, science and geography.	Links with Science and Math's.	Links with Math's, English, science and geography.
SMSC, British Values, Cultural Capital	British standards/values taught throughout engineering/workshop environment.		Understanding culture/clients/stake holders.	This unit covers a lot of environmental issues and green design.	N/A	This unit covers a lot of environmental issues and green design.
CEIAG	Progression from these qualifications: **Apprenticeship** e.g Design and Development Technician **Cambridge Technicals** Engineering (Levels 2 and 3) **T Level** Design and Development for Engineering and Manufacturing (Level 3) **A Level** Design and Technology (Level 3)				• analyse existing products • demonstrate applied mathematical skills • demonstrate their technical knowledge of materials, product functionality, manufacturing processes and techniques • demonstrate their understanding of wider social, moral and environmental issues that impact on the design and manufacturing industries	

Learning outside the classroom	Students have several home works based on research and how companies operate safely.	Students have to research ideas and investigate the design brief.	Students research existing products. Students learn about industrial processes through product disassembly.	Students use all Resources available to them to revise, including teams.	N/A	Students use all Resources available to them to revise, including teams. Completing past papers.
Additional Subject Specific Information	This unit also cover packaging and forming batch production Molds.	The schools health and safety office gives a talk which explains the schools fire/safety policy.	The design brief is set externally.	Students can take this exam in Jan and retake in the summer.	Products need to be manufactured from a engineering drawing.	After school clubs available for anyone on the risk register.

KS5 A Level Engineering Curriculum Mapping

Engineering Y13						
Term	**Autumn (1)**	**Autumn (2)**	**Spring (1)**	**Spring (2)**	**Summer (1)**	**Summer (2)**
Topic(s)/ Subjects(s)	Designing (coursework)	Development (Coursework)	Manufacturing (coursework)	Manufacturing (coursework)	Exam revision	Exam revision
Knowledge and skills (Content)	Demonstrate an understanding of how to use annotated sketching and digital tools to graphically communicate ideas and sketch modelling to explore possible improvements, in terms of physical requirements, such as: • function, usability, construction, movement, stability, composition, strength • aesthetic qualities • manufacturing processes • suitability of materials and components.	Demonstrate an understanding of methods used to represent systems and components to inform third parties, including: i. constructional diagrams/working drawings ii. digital visualisations iii. circuit and system diagrams iv. flowcharts with associated symbols v. prototypes and models.	Understand that the selection of materials and components is influenced by a range of factors, including: i. functional performance ii. aesthetics iii. cost and availability iv. properties and characteristics v. environmental considerations vi. social, cultural and ethical factors.	Demonstrate an understanding of the need to incorporate knowledge from other experts and subjects to inform design and manufacturing decisions, including the areas of science and mathematics.	Demonstrate an understanding of the functions that mechanical devices offer to products, providing different types of motion, including: i. rotary ii. linear iii. reciprocating iv. oscillating. i. gears, cams, pulleys and belts, levers, linkages, screw threads, worm drives, sprockets, chain drives and belt drives ii. epicyclic gear systems iii. bearings and lubrication iv. efficiency in mechanical systems	1. Identifying requirements 2. Learning from existing products and practice 3. Implications of wider issues 4. Design thinking and communication 5. Material considerations 6. Technical understanding 7. Manufacturing processes and techniques 8. Viability of design solutions 9. Health and safety.
Assessment	This unit is internally assessed and used as an introduction to the course to allow students to work in a safe and secure environment.	This unit is a physical portfolio. Marked internally and moderated externally. The unit is weighted at 25% of the GCSE.	This unit is produced as a e-portfolio. Marked internally and moderated externally. The unit is weighted at 25% of the GCSE.	Assessed through an externally set written examination paper, worth a maximum of 60 marks and 1 hour in duration.	The center-assessed task: • will be practical tasks in the context of an assignment, selected from the OCR bank of set	Assessed through an externally set written examination paper, worth a maximum of 60 marks and 1 hour in duration.

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