MOOR PARK HIGH SCHOOL: CURRICULUM

Key Stage 4 Long Term Planning

Year 10/11 2021-2022 SYLLABUS: BTEC Engineering Tech Award L1/2

Year 10	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Syllabus	COMPONENT 2: INVESTIGATING AN ENGINEERING PROJECT Learning aim A: Understand materials, components and processes for a given engineered product.	C2 Learning aim B: Investigate a given engineered product using disassembly techniques	C2 Learning aim C: Plan the manufacture of and safely reproduce/inspect/test a given engineered component	Component 1: Exploring Engineering Sectors and Design Applications Learning aim B: Explore engineering skills through the design process	C1 LAB Continuation.	C2 Learning aim A: Understand engineering sectors, products and organisations, and how they interrelate.
Links to prior learning	Properties of materials. Simple mechanical components. Electrical circuits and components	Measuring skills Written Descriptions. Sketching.	Mathematics. Measuring Reasoning.	Planning and reasoning. 2D CAD Mathematics. Drawing.	Planning and reasoning. 2D CAD Mathematics. Drawing.	Research skills.
Knowledge	Learners will investigate the materials, components and processes used in the production of engineered products. A1 Materials Engineering material categories: ferrous, e.g. mild steel, wrought iron, stainless steel Non-ferrous e.g. aluminium	Learners will investigate engineered products by using practical engineering skills and techniques, such as disassembly and assembly, observation and measurement. B1 Practical engineering skills Observing and recording skills, such as an examination of:	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 Defining the problem. Developing possible solutions. Choosing a solution. Making using engineering processes.	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. Interpreting an engineering Brief e.g. physical requirements, aesthetics, size, function, performance requirements Producing	"	Engineering sectors, engineered products and interconnections. Engineering definition in context: the safe application of technical & practical knowledge to transform ideas and materials. The need for people who are qualified in an engineering discipline and if possible are experts in more than one discipline (e.g. electrical/electronics engineer)

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	titanium, copper, silver, zinc Thermosetting polymers e.g. phenol -formaldehyde, polyimides, polyurethane Thermoforming polymers e.g. polyethylene, polypropylene, acrylic Properties of engineering materials: Strength, hardness, toughness Characteristics of engineering materials, such as: Machinability, workability, durability A2 Components Types of components, such as: proprietary, e.g. rivet, nut and bolt, screw, key, mechanical fixings, electronic components, such as resistors, capacitors, fuses, diodes Product specific, e.g. bush, flange, printed circuit board	visual features, surface features, mass, colour, Degradation, identification marks. Measurement skills, such as: measuring ,diameter, measuring linear dimensions. Use of comparative techniques Knowledge of component values e.g. resistors. Appraisal/interpretation skills, such as justifications and reasoning B2 Disassembly techniques Safe use of disassembly techniques, to include: removal of semi-permanent fixings, parts removal and layout, replacement of non -reusable consumables or fixings. Safe use of tools and equipment – disassembly/reassembly tools with settings.	Inspecting and testing chosen solution. Evaluating outcome of project. C2 Develop a production plan. Developing a production plan to include health and safety operations/processes Inspection testing and quality standards equipment/tools materials and components quantity, e.g. one-off, batch, mass production. Awareness of risks and hazards for making processes. Safe preparation, good housekeeping and close down of the work area. Making skills associated with the product to be produced, e.g. choosing suitable tools, appropriate set up of the work area/machine, adaptation according to inspected outcomes. Skills in observing	initial design proposals e.g. researching existing products, producing design sketches in 2D and 3D, using creative thinking and evaluation techniques to generate the best solution given the brief Computer -aided design CAD drawings using drawing, editing, modification and manipulation commands to generate engineering drawings and circuit diagrams on templates to the appropriate standard. Generating final design solution using 2D drawing techniques and 3D models e.g. detailed drawings, circuit diagrams, 3D printing, physical modelling. Making final design solution decisions e.g. selection of materials, selection of making techniques, considering quality requirements How		and can use their skills to help solve real-world problems. Engineering sectors e.g.aerospace, automotive, communications, electrical/electronic, mechanical, environmental, transport, rail, marine. Engineered products from different sectors and combinations of sectors, e.g. aerospace …….. Organisations, functions and job roles, developing their understanding of how these contribute to career progression in engineering. Examples of engineering organisations A range of examples covering the sectors, e.g. research and development organisations, manufacturing organisations, service organisations. Specialist organisations in sectors e.g. manufacturer of aircraft wings, hydraulic systems.

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	Characteristics of components, e.g. permanent/semi -permanent, sizes/dimensions, surface roughness, values, fixing methods. A3 Processes Types of engineering processes: cutting e.g. drilling, sawing, filing, shearing Shaping e.g. turning, milling Forming e.g. forging, casting, extruding, moulding, folding, bending Joining, e.g. fastening, bonding, soldering, brazing.	B3 Product design specification (PDS) Requirements in terms of size and Mass,product life and reliability Performance/function/ service requirements Economic and making considerations Implications of standards and legislation.	and recording techniques e.g. in process measurement and comparison.	employees work in a team and peer review during the engineering design and make process with the customer as a focus using generic skills e.g. behaviours, attitudes, limitations, respect for others, professionalism, working relationships, collaborative skills.		Functions in organisations, e.g. research, design, planning, making, quality, marketing, selling, customer service, installation. Engineering job roles, e.g. maintenance technician, machine operator, aircraft fitter, design engineer, manufacturing engineer, installation engineer, process engineer, telecommunications engineer. Career progression opportunities, e.g. apprentice, operator, technician, technical, professional, management. Role definitions :unskilled, skilled, technical
Skills	Understanding material properties and the technical terminology used. Differences between ferrous and non-ferrous metals. Properties and differences between thermoset and thermoformed plastics. material properties. Understanding different machining characteristics.	Disassembly techniques and tools. Observing, identifying and measuring components. Recording observations. Justifying material and process choices. Generate product design specifications	Defining problems. Produce solutions to problems. Choose solution. Awareness of health and safety. Area preparation Making skills using engineering process. Inspect component. Evaluate process	Understand an engineering brief. Interpret requirements. Produce design concepts. Produce CAD drawings. Working as a team	“	Research around engineering sectors. Understanding of types of engineering. Analyze Engineering Assess products. …… Research around engineering organizations. Analyze job roles. Identify engineering sectors attached to a product.

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	Identifying types of component. Machining processes					Analyse products and components Present data
Assessment	Learning Aim A of Component 2 Focus on and review of, topics A1, A2 and A3 Students will be given an engineering product (bicycle brake caliper) to investigate to identify the proprietary and specialist components used to make the product and then investigate the materials used to make the components.	Learning Aim B of Component 2 Focus on and review of, topics B1, B2 and B3 Students will be given an engineering product to investigate to disassemble, in order to produce a product design specification. Learners will need to record each component, its features and function	Learning Aim C of Component 2 Focus on and review of, topics C1 and C2 Students will plan and manufacture an engineering component from their investigation carried out for Learning Aim B	Learning Aim B of Component 1 Focus on and review of, topics B1 Students will be given a brief and respond to this with design sketches, models	Continuation of Learning Aim B of Component 1 Focus on and review of, topics B1 Students will continue with a brief and construct a detailed design with 2D CAD and 3D models with evidence of design meetings	Learning Aim A of Component 1 Focus on and review of, topics A1 and A2 Students will be given an engineering product to investigate the sectors involved in its manufacture and organizations from the sector
Homework	Weekly homework selected from research topics	Weekly homework selected from research topics. Assignment work	Weekly homework selected from homework packs and tailored to individuals	Weekly homework selected from topics. Assignment work	Weekly homework selected from topics. Assignment work	Weekly homework selected from topics. Assignment work
Cultural enrichment including Trips, Visits, Experiences, Extra-curricular	**<u>School and University Network</u>** Trip 1- Magnets and Motors Trip 2- Life on Mars					
Literacy	Reading material properties. Identifying the difference between ferrous and non-ferrous metals.	Describe disassembly. Recording observations and measurements. Using interpretative skills to reason and	Writing a production plan. Describing health and safety. Observing and recording process	Read and interpret design briefs. Write specifications. Creating designs. Writing presentations. Justify ideas.	Read and interpret design briefs. Write specifications. Creating designs. Writing presentations. Justify ideas.	Develop reasoning and explanations of Engineering sectors. Use Engineering specific terminology. Consider job roles and career progression.

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	Describing thermoset and thermoformed plastics. Researching material properties. Describe machining characteristics. Identifying types of component. Explaining machining processes.	justify the use of components. Producing a product design specification.	measurements and comparisons		Critically review other students work. Write constructive critical review.	Identify job specifications and research vacancies and requirements. Evaluate career paths and average pay. Present a structured report on an engineered product
Numeracy	Using correct units. Strength Stiffness Comparing properties. Calculating strength Measurements Tolerances Fit Temperature	Measuring Recording Calculating volumes Calculating Mass Density	Measuring with precision equipment. Recording to correct decimal places. Comparing size Tolerance Fit. Weighing	Measuring dimensions Planning with measurements. Calculating mass. Counting Using multiple measurements to calculate dimensions and clearances	Measuring dimensions Planning with measurements. Calculating mass. Counting Using multiple measurements to calculate dimensions and clearances	Extract data on engineering sectors from research Size of organizations. Employee numbers. ……. Employment Salaries. Scales. Distances. Size, dimensions and mass
CIAG	Scenario – working in a Bicycle repair shop as technician. Materials Engineer. Process Engineer. Mechanical Engineer.	Scenario - working in a Bicycle repair shop. Design Engineer Maintenance Engineer	Scenario- Working as an Aviation Structural Engineer. Mechanical Engineer. Repair Technician. Airframe Fitter	Design engineer Process engineer Quality controller	Design engineer Process engineer Quality controller	Aerospace, Automotive Communications, Electronics Mechanical Environmental Engineering

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Year 11 2020-2021 SYLLABUS:

Curriculum Area:

Year 11	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1
Syllabus	Component 3: Responding to an Engineering Brief A Carry out a process to meet the needs of an engineering brief	B Provide a design solution for an engineered product against the needs of an engineering brief	C Provide solutions to meet the needs of an engineering brief	Synoptic 1	Synoptic 2
Links to prior learning	Mathematics Measuring skills Science practicals Handling data Graphs Observation skills	Understanding a brief Sketching Measuring Evaluating a design Materials	Analysing data Material properties Technical drawings Data handling	-	-
Knowledge	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 Following planned procedures. Using and testing a prototype/model. Assembling, handling and using materials, equipment and machinery. A2 Recording the process. Measuring and recording data with accuracy and precision using appropriate units.	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 B1 Interpretation of a given brief for an engineered product	Learners will develop an understanding of how to 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 Types of engineering information to include production data, engineering drawings, job cards.	Preparation and Completion of externally set task	Preparation and Completion of externally set task

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	Tabulating appropriate data in the correct format accurately and to a suitable degree of precision. Displaying appropriate data graphically with accuracy: chart/graph line/curve of best fit axis scaling labelling. Observation skills, e.g. noting problems with practical activities. A3 Interpretation of data Identifying anomalous results or sources of error. Comparison of trends /patterns in data, to include tables, charts and graphs. Evaluating the process to include testing process used, recording/processing results. Drawing valid conclusions. Making recommendations related to engineering briefs.	Analysing the existing product with reference to the brief. Dimensions and tolerances to include: linear, radial, surface finish. Physical form to include: 2D, 3D, flat, curved. Attributes to include : low resistance, sharp corners, moisture traps. Materials, e.g. aluminium, steels, polymers. Processes, e.g. fabrication, drilling. B2 Redesign Identifying relevant issues with existing design. Design sketching to include 2D, 3D, exploded diagrams, annotation, circuit diagrams. Design for manufacture, e.g. fabricate, forge, cast, machined. Design ideas, e.g. variation in form, variation in approach, use of different methods, use of different componentry. B3 Evaluation Reviewing the credibility of the design ideas given the needs of the brief. Selecting the most appropriate design solution.	Interpreting patterns and trends related to the engineering information. Identifying issues and causes associated with the problem. C2 Selecting a solution Possible solutions for current and/or potential issues, e.g. design, tooling, process Extent to which the solutions have fulfilled their primary purpose. Any wider factors that need to be considered in order to meet the brief e.g. resources, need for batch production, safety restrictions, environmental impact. Ways in which the solution might be improved on against its primary purpose and/or other factors. Using the best-fit approach to select the best solution Identifying advantages and disadvantages/limitations/ constraints.		

		Justification of the design solution. Justification of the processes to be used.	Justifying the best solution Reflecting on processes and making recommendations for improvements to the best solution. C3 Problem solution; Resources required and their use, to include materials, tools, components, equipment, apparatus, e.g. instruments, sensors Designs of solution to include diagrams, sketches, including measurements, labels/annotation Make processes, to include following the steps needed to create a prototype solution, e.g. rapid prototyping. Processes to follow, e.g. in relation to using tools and equipment, and health and safety. Manufacturing processes to use, e.g. casting, forging, welding, us e of jigs and tools Data collection requirements to include what quantitative and qualitative data must be		

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			Recorded, resource material, data sources. Data analysis and quality to include trends, meeting specifications, possible solutions Safety considerations to include hazards and requirements of Control of Substances Hazardous to Health (COSHH) Regulations 2002 where appropriate. Considering timescales.		
Skills	Carrying out a planned procedure. Using prototypes. Assembling and handling materials. Recording data accurately and precisely. Graphs. Interpret anomalous data .Drawing conclusions.	Analysing an existing product with reference to a brief. Identifying relevant issues with existing design. Design for manufacture Justification of the design solution. Justification of the processes to be used. Selecting the most appropriate design solution.	How to analyse information in an engineering context. Analysing engineering information associated with the problem Interpreting patterns and trends related to the engineering information. Identifying issues and causes associated with the problem. Using the best -fit approach to select the best solution. Safety considerations to include hazards and requirements of Control of Substances Hazardous to Health (COSHH) Regulations.		

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Assessment	This external component builds on knowledge, understanding and skills acquired and developed in Components 1 and 2 Learners will apply developed skills in problem solving, design and communication to enable them to respond to engineering briefs. learners will be assessed on their ability to produce solutions to problems using combinations of engineering skills. It is expected that learners are able to draw on the skills developed across Components 1 and 2	Homework Worksheets Practice Assessments	Homework Worksheets Practice Assessments	Externally assessed tasks A set task comprised of two parts worth 60 marks in total will be completed under supervised conditions. The supervised assessment period is two hours for Part 1 and one and a half hours for Part 2. Both parts of the set task are completed during a one-week period timetabled by Pearson. The assessment availability is February and May/June only. For assessment learners will be given a brief to carry out a practical set task before completing the three activities based on the practical task . An additional task, consisting of two activities will target higher-order planning, redesign and evaluative skills and relate to independent scenarios. learners will be assessed on their ability to produce solutions to problems using combinations of engineering skills. It is expected that learners are able to draw on the skills developed across Components 1 and 2	Externally assessed tasks A set task comprised of two parts worth 60 marks in total will be completed under supervised conditions. The supervised assessment period is two hours for Part 1 and one and a half hours for Part 2. Both parts of the set task are completed during a one-week period timetabled by Pearson. The assessment availability is February and May/June only. For assessment learners will be given a brief to carry out a practical set task before completing the three activities based on the practical task An additional task, consisting of two activities will target higher-order planning, redesign and evaluative skills and relate to independent scenarios. learners will be assessed on their ability to produce solutions to problems using combinations of engineering skills. It is expected that learners are able to draw on the skills developed across Components 1 and 2

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Homework	Weekly homework selected from topics.	Weekly homework selected from topics	Weekly homework selected from topics	Weekly homework selected from topics	
Cultural enrichment including Trips, Visits, Experiences, Extra-curricular	**<u>School and University Network</u>** Trip 1-Young Scientist Centre (details to be confirmed) Trip 2-Young Scientist centre				
Literacy	Recording data accurately and precisely. Tabulating Data. Graphs including line of best fit. Observing and noting. Making recommendations.	Interpretation of a given brief for an engineered product Analysing the existing product with reference to the brief. Terminology: linear, radial, surface finish, 2D, 3D, flat, curved, low resistance, sharp corners, moisture traps. Justification of the design solution. Justification of the processes to be used.	Generating engineering information, to include: production data, engineering drawings, job cards. Presenting possible solutions for current and/or potential issues, e.g. design, tooling, process. Reflecting on processes and making recommendations for improvements to the best solution.		
Numeracy	Tabulating data Creating graphs Line of best fit Curve of best fit Axis Precision Accuracy	Dimensions and tolerances to include: linear, radial, surface finish.	Data collection requirements: Quantitative and qualitative data. Data analysis and quality: Trends, meeting specifications		
CIAG	Mechanical Engineer. Laboratory Technician. Bolt, Screw and Nail technician. Development Engineer	Design Engineer Automotive engineer Research and Design Officer	Design Engineer Mechanical Engineer Health and Safety Officer Quality Controller		

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