BTEC ENGINEERING LEVEL 3 DIPLOMA

Year 13

What are the aims and intentions of this curriculum?

The Pearson BTEC Level 3 National Diploma in Engineering has primarily been designed for learners who want to pursue a career in engineering. They can either progress directly to an apprenticeship or employment as an engineering technician, or can choose to progress to higher education to study for an engineering degree (or specialist engineering subject, such as aeronautical engineering). The qualification is equivalent in size to two A Levels and is intended to be a Tech Level qualification. It has also been designed to meet the (TechBacc) measure when studied alongside Level 3 mathematics and the Extended Project Qualification (EPQ).

Term	Topics	Knowledge and key terms	Skills developed	Assessment
Autumn 1	**Units:** 4 - Applied Commercial and Quality Principles in Engineering 14 - Electrical Installation of Hardware and Cables	**Unit: 4** - • Business functions and key activities • Trade considerations • Competitive advantage • Reasons for cost control and types of costs • Activity-based costing method • Quality systems • The principles and processes of value management	**Unit: 4** - Learners explore commercial engineering, for example key business activities and cost control, quality systems and value management, which engineering organisations use to create value.	**Unit: 4** • A written report that evaluates how key business activities and trade considerations influence a local engineering organisation and can create competitive advantage. • A research and problem-solving project to explore the costs associated with engineering activities and to complete an activity-based cost model for a product or service. • A research activity to explore the quality system and value management processes. Also, an applied value analysis exercise to determine if further value can be created from an engineering product or service

		Unit: 14 – • Types of electrical installation • Statutory and non-statutory regulations • Reducing the risk of electrical shock • Circuit protection methods • Lighting circuits for domestic installations • Power circuits for domestic installations • Circuits for commercial installations • Cables • Connectors • Wiring enclosures • Sustainability • Safe working practices • Safe working procedures • Circuit testing	**Unit: 14** - Learners develop knowledge and skills to interpret electrical circuit diagrams and protection systems, and install lighting and power circuits safely.	**Unit: 14 –** • A report detailing the requirements of appropriate statutory and non-statutory regulations, circuit protection methods and identifying areas of increased risk. • A report analysing given domestic and commercial electrical installations in terms of the suitability of components to meet the requirements of regulations and guidance relative to the application. • Safe construction of an electrical installation (preferably wall mounted) together with a log detailing construction, testing, calculations, circuit layout and construction plans, photographs, one or more observational witness statements and a formal assessment of the final installation, with reference to how sustainability issues have been considered.

Autumn 2	**Units:** 4 - Applied Commercial and Quality Principles in Engineering 14 - Electrical Installation of Hardware and Cables	**Unit: 4** - • Business functions and key activities • Trade considerations • Competitive advantage • Reasons for cost control and types of costs • Activity-based costing method • Quality systems • The principles and processes of value management **Unit: 14 –** • Types of electrical installation • Statutory and non-statutory regulations • Reducing the risk of electrical shock • Circuit protection methods • Lighting circuits for domestic installations • Power circuits for domestic installations • Circuits for commercial	**Unit: 4** - Learners explore commercial engineering, for example key business activities and cost control, quality systems and value management, which engineering organisations use to create value. **Unit: 14** - Learners develop knowledge and skills to interpret electrical circuit diagrams and protection systems, and install lighting and power circuits safely.	**Unit: 4** • A written report that evaluates how key business activities and trade considerations influence a local engineering organisation and can create competitive advantage. • A research and problem-solving project to explore the costs associated with engineering activities and to complete an activity-based cost model for a product or service. • A research activity to explore the quality system and value management processes. Also, an applied value analysis exercise to determine if further value can be created from an engineering product or service **Unit: 14 –** • A report detailing the requirements of appropriate statutory and non-statutory regulations, circuit protection methods and identifying areas of increased risk. • A report analysing given domestic and commercial electrical installations in

		installations • Cables • Connectors • Wiring enclosures • Sustainability • Safe working practices • Safe working procedures • Circuit testing		terms of the suitability of components to meet the requirements of regulations and guidance relative to the application. • Safe construction of an electrical installation (preferably wall mounted) together with a log detailing construction, testing, calculations, circuit layout and construction plans, photographs, one or more observational witness statements and a formal assessment of the final installation, with reference to how sustainability issues have been considered.

Spring 1	**Units:** 5 - A Specialist Engineering Project 19 - Electronic Devices and Circuits	**Unit: 5 –** • Project life cycle • Project idea generation and solution development • Feasibility study of solutions • Planning and monitoring project-management processes • Risk and issue project-management process • Technical specification • Design information • Undertake and test the solution to the problem • Demonstration of relevant behaviours • Present a solution to the problem • **Unit: 19 –** • Safe electronic working practices • Diode devices and diode-based circuits • Transistor devices and transistor-based circuits • Operational amplifier circuits	**Unit: 5** - Learners apply project management principles to undertake a 30-hour individual project and will produce a product, system or process relevant to their specialist area of study. **Unit: 19** - Learners explore the operation of electronic devices and their uses in circuits through simulation and practical exercises to build and test physical analogue and digital circuits.	**Unit: 5 –** • Research evidence, investigating an initial idea, and possible solutions, scoping out alternative technical solutions and a feasibility study report of the possible solutions • Evidence of applying project management processes such as planning during the design of a solution. Also, the development of a technical specification that may include design documentation such as orthographic projections, of the chosen solution. • Evidence of applying project management processes, such as project monitoring, and applying relevant behaviours during the development and testing of a solution. A portfolio of evidence generated while completing the specialist project, reviewing the processes and reflecting on own performance. **Unit: 19 –** • A report containing circuit diagrams, photographs, tables of results, sketches, screenshots, calculations and an evaluation of the physical and simulated

		• Schematic capture and simulation of analogue circuits • Testing physical analogue circuits • Logic gates and Boolean algebra • Combinational logic circuits • Sequential logic circuits • Schematic capture and simulation of digital circuits • Testing physical digital circuits • Lessons learned from exploring electronic devices and circuits • Personal performance while exploring electronic devices and circuits		circuits, supported by observation records and/or witness statements. • A report containing circuit diagrams, photographs, tables of results, sketches, screenshots, calculations and an evaluation of the physical and simulated circuits, supported by observation records and/or witness statements. • The evidence will focus on the skills and knowledge gained when exploring analogue and digital electronic devices and their common applications, reflecting on the ways in which theoretical, simulated and measured values compare. The portfolio of evidence generated while exploring electronic devices and circuits, reflecting on own performance.

Spring 2	**Units:** 5 - A Specialist Engineering Project 19 - Electronic Devices and Circuits 24 – Maintenance of Mechanical Systems 43 – Manufacturing Computer Numerical Control Machining Processes	**Unit: 5** - • Project life cycle • Project idea generation and solution development • Feasibility study of solutions • Planning and monitoring project-management processes • Risk and issue project-management process • Technical specification • Design information • Undertake and test the solution to the problem • Demonstration of relevant behaviours • Present a solution to the problem • **Unit: 19** - • Safe electronic working practices • Diode devices and diode-based circuits • Transistor devices and transistor-	**Unit: 5** - Learners apply project management principles to undertake a 30-hour individual project and will produce a product, system or process relevant to their specialist area of study. **Unit: 19** - Learners explore the operation of electronic devices and their uses in circuits through simulation and practical exercises to build and test physical analogue and digital circuits.	• **Unit: 5** - Research evidence, investigating an initial idea, and possible solutions, scoping out alternative technical solutions and a feasibility study report of the possible solutions • Evidence of applying project management processes such as planning during the design of a solution. Also, the development of a technical specification that may include design documentation such as orthographic projections, of the chosen solution. • Evidence of applying project management processes, such as project monitoring, and applying relevant behaviours during the development and testing of a solution. A portfolio of evidence generated while completing the specialist project, reviewing the processes and reflecting on own performance. **Unit: 19 –** • A report containing circuit diagrams, photographs, tables of results, sketches, screenshots, calculations

		based circuits • Operational amplifier circuits • Schematic capture and simulation of analogue circuits • Testing physical analogue circuits • Logic gates and Boolean algebra • Combinational logic circuits • Sequential logic circuits • Schematic capture and simulation of digital circuits • Testing physical digital circuits • Lessons learned from exploring electronic devices and circuits • Personal performance while exploring electronic devices and circuits **Unit: 24** - • Lubricant characteristics • Lubrication of mechanical systems • Mechanical seal characteristics and common applications • Bearing characteristics and common applications • Fasteners characteristics and	**Unit: 24** - Learners explore the processes and components associated with the maintenance of mechanical systems and undertake maintenance tasks on a mechanical system.	and an evaluation of the physical and simulated circuits, supported by observation records and/or witness statements. • A report containing circuit diagrams, photographs, tables of results, sketches, screenshots, calculations and an evaluation of the physical and simulated circuits, supported by observation records and/or witness statements. • The evidence will focus on the skills and knowledge gained when exploring analogue and digital electronic devices and their common applications, reflecting on the ways in which theoretical, simulated and measured values compare. The portfolio of evidence generated while exploring electronic devices and circuits, reflecting on own performance. **Unit: 24** - • A report about the characteristics of lubricants and their application in two mechanical systems. • A report about the characteristics, maintenance considerations and applications of common consumables and the

		common applications • Gear train function and operation in power transmission systems • Typical function and operation of other power transmission components • Safe working practices when undertaking routine maintenance • Routine maintenance tasks on mechanical systems **Unit: 43** – • CNC machine tool control systems • Open and closed loop feedback systems • Part-programming methods and program efficiency • CNC processes for milling and turning • Tooling parameters • Component parameters • Machine set-up parameters • Development of a CNC part program • Sustainability considerations • Manufacture of a component using a Computer Numerical Control machine • Safe working practices • Component quality checks • Lessons learned from programming and machining a component • Personal performance whilst machining a component	**Unit: 43** - Learners examine the principles of Computer Numerical Control (CNC) machining, and develop a computer part program and manufacture a component using a CNC machine.	operation and maintenance considerations of power transmission components used in mechanical systems. • Practical activity to complete maintenance tasks safely. Evidence will include a record of the procedures followed, observations records and correctly completed documentation . **Unit: 43** • A written report to investigate the control mechanism of a typical industrial CNC machine, based around open loop and closed loop systems, and its relationship to achieving accuracy via a computer program • Preparation activities and documents prior to CNC machining a product or component, to include: machine tool set-up sheet and a computer part program, and simulation of the program. Input the part program and set up the CNC machine, to produce a component, using multiple tooling. Carry out quality control checks to verify that the component meets the specification and is fit for the intended purpose.

				• The evidence will focus on what went well and what did not go so well when programming and machining a component, and a conclusion of improvements that could be made. The portfolio of evidence will be generated whilst machining a component and reviewing the processes and reflecting on own performance.
Summer 1	24 – Maintenance of Mechanical Systems 43 – Manufacturing Computer Numerical Control Machining Processes	**Unit: 24** - • Lubricant characteristics • Lubrication of mechanical systems • Mechanical seal characteristics and common applications • Bearing characteristics and common applications • Fasteners characteristics and common applications • Gear train function and operation in power transmission systems • Typical function and operation of other power transmission components • Safe working practices when undertaking routine maintenance • Routine maintenance tasks on mechanical systems	**Unit: 24** - Learners explore the processes and components associated with the maintenance of mechanical systems and undertake maintenance tasks on a mechanical system.	**Unit: 24** - • A report about the characteristics of lubricants and their application in two mechanical systems. • A report about the characteristics, maintenance considerations and applications of common consumables and the operation and maintenance considerations of power transmission components used in mechanical systems. • Practical activity to complete maintenance tasks safely. Evidence will include a record of the procedures followed, observations records and correctly completed documentation with witness signatures against each completed task.

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