Electricity

Unit Reference Number	A/618/6103
Unit Title	Electricity
Unit Level	3
Number of Credits	10
Total Qualification Time (TQT)	100
Guided Learning Hours (GLH)	40
Mandatory / Optional	Mandatory
Sector Subject Area (SSA)	14.1 Foundations for learning and life
Unit Grading Structure	Pass / Fail

Unit Aims

The aim of this unit is for learners to develop the ability to be able to apply knowledge of AC and DC circuit theory to circuit design. Learners will also understand the fundamental principles of electricity and electromagnetic radiation.

Learning Outcomes, Assessment Criteria and Indicative Content

Learning Outcomes – The learner will:	Assessment Criteria – The learner can:	Indicative contents
1. Understand the functions of basic electrical components within circuits.	1.1 Describe different circuit topography and their effects on components. 1.2 Identify a range of common electrical components and their conventional symbols. 1.3 Describe electrical current and potential difference.	• Topography: form taken by the network of interconnections of the circuit components : Series and parallel circuits: Series parallel, Y, Delta, T • Components and their symbols: Resistors, Capacitors, Light Emitting Diode (LED), Transistors, Inductors, Integrated Circuit (IC) • Electricity flow conventions: Conventional Current Direction, Current versus Drift Speed, The Nature of Charge Flow • Current and potential difference - The potential

		difference (or voltage) of a supply is a measure of the energy given to the charge carriers in a circuit. Units = volts (V). This is the voltage between two points that makes an electric current flow between them. • Current–voltage characteristic or I–V curve (current–voltage curve)
2. Be able to apply AC and DC circuit theory to circuit design.	2.1 Design DC circuits. 2.2 Describe Ohm's law and identify I/V characteristics. 2.3 Calculate total resistance and total current for a circuit that is a combination of resistors connected in series and parallel. 2.4 Explain Kirchhoff's voltage and current laws. 2.5 Discuss how to apply circuit protection.	• Electrical circuits are connected in series or in parallel. Circuit components are shown as symbols. • Circuit layout (e.g. DC power source, resistors in series, resistors in parallel, series and parallel combinations, potential divider) • Application of Ohm's law – discovered by German scientist Georg Simon Ohm: voltage or potential difference between two points is directly proportional to the current or electricity passing through the resistance, and directly proportional to the resistance of the circuit. The formula for Ohm's law is V=IR. • Power calculations : V = IR, P =IV, P = I2R • Application of Kirchhoff's voltage and current laws: • Kirchhoff's current law: the algebraic sum of currents in a network of conductors meeting at a point is zero. • Kirchhoff's voltage law/ Second Law: • The directed sum of the potential differences (voltages) around any closed loop is zero. • Apply circuit protection i.e. fuse, diode, resettable thermal fuse, circuit breaker (e.g. over current and earth leakage types)
3. Understand power supplies and	3.1 Explain an alternating current (AC) supply.	○ Alternating current (AC) - changes direction

power system protection.	3.2 Explain a direct current (DC) supply. 3.3 Draw a labelled block diagram of a stabilised power supply.	periodically. Voltage level also reverses along with the current. AC is used to deliver power to houses, office buildings, etc. ○ Direct current (DC) only flows in one direction, found in electrical cells or batteries ○ Stabilised power supply showing: ○ AC input ○ transformer ○ rectifier ○ smoothing circuit ○ stabilising circuit ○ DC output

Assessment

To achieve a 'pass' for this unit, learners must provide evidence to demonstrate that they have fulfilled all the learning outcomes and meet the standards specified by all assessment criteria.

Learning Outcomes to be met	Assessment criteria to be covered	Type of assessment
All 1 to 3	All AC under LO 1 to 3	Coursework – The assessment focuses on breadth, challenge and application. Learners will draw on and extend the skills they have learned during the teaching of the unit.

Indicative Reading list

- Ryan, C. (1986) *Basic electricity: a self-teaching guide*. 2nd ed. John Wiley
- Gussow, M (2011) *Basic Electricity Revised*. Schaum's Outlines
- Cooke, E. et al (2010) *BTEC Level 3 National Engineering Student Book*. Pearson