basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

2023/24 ANNUAL TEACHING PLANS: ELECTRICAL TECHNOLOGY (DIGITAL ELECTRONICS): GRADE 10 (TERM 1)

TERM 1	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11
CAPS TOPIC	**Occupational health and safety**	**Occupational health and safety**	**Tools and measuring instruments**	**Basic principles of electricity**	**Basic principles of electricity**	**Basic principles of electricity**	**Basic principles of electricity**	**Basic principles of electricity**	**Basic principles of electricity**	**Pat consolidation, revision and assessment**	**Pat consolidation, revision and assessment**
TOPICS, CONCEPTS, SKILLS AND VALUES	**Responsibilities** - What are your rights in the workshop? - What are your responsibilities in the workshop? **General workshop rules** - Housekeeping (health hazards, safety hazards, workshop layout, workshop management) **Workshop safety** - Unsafe acts - Unsafe conditions - Walkways (colour codes), store areas, other designated areas - Information and safety signs - Signs in the workshop - Information signs - Safety signs - Prohibition signs - Fire safety signs - Regulatory signs Note: Clean the workshop on a weekly basis **Emergency procedures** - Placement of the master switch - Critical versus non-critical emergencies - Medical emergencies - Electrical shock and electrocution procedures - Evacuation procedures - Principles of fire fighting **Practical:** Perform an evacuation exercise for the workshop	**Basic first aid** - What is HIV, AIDS and infectious disease? - How are diseases transferred? - What to do when someone is bleeding - What to do when someone has been burnt - What to do in case of electrical shock - How to administer CPR **Practical:** Perform a first aid exercise (choose a topic from basic first aid) **Chemical safety** (printed circuit board manufacturing) - Personal protection equipment - Handling chemicals (mixing of chemicals, disposing of chemicals, corrosive chemicals) - Where to work with chemicals (ventilation, lighting, designated area) - Chemical processes in making PCBs (preparing PCBs, developing the circuitry, etching the board, protecting the board) - Environmental considerations	**Identification of the parts, functions of parts, care, maintenance, correct and safe use of the following tools:** - Screwdriver (flat and Phillips) - Files (flat, square, round, triangular and half round) - Side cutter - Long-nosed pliers - Combination pliers - Wire stripper - Utility knife - Soldering iron - Solder sucker - Electric hand drill, drill press, PCB drill (DREMEL) - Hack saw (junior hack saw) - Breadboard - The oscilloscope (teacher to set up instruments)	**Atomic theory** - Theory of current flow (electron flow vs. conventional current flow) - Resistive characteristics of different materials - Conductors, semiconductors, insulators - What is a conductor, semiconductor, insulator? - 2-3 examples of each and their characteristics. No further theory needed - A wire is a conductor, but not all conductors are made of wire (electrical shock and safety) - Types of materials used as conductors: Copper, aluminium, gold, silver, steel, and nickel chrome wire - Specific resistance (no calculations) - Negative and positive temperature coefficient (no calculations)	**The resistor** - What is a resistor? - Composition of a resistor - Types of resistors - Tolerance (indicated value vs. measured value) (2% and 5%) - Colour code of resistors (4-band and 5-band resistors) - Power vs. size (1,8w, 1,4w, 1,2w, 2w and 5w) - Measuring the value of resistors - Calculating the value of resistors - Potentiometer (construction, functional operation, symbols) - Rheostat (difference between a potentiometer and rheostat (construction, functional operation, symbols)	**Ohms law** Ohm's Law: V=IR (Ω) - Verify Ohm's Law with calculations - Pay attention to prefixes and unit conversions Series circuit as voltage divider - Kirchhoff's voltage divider: o $VT = V1 + V2 + \cdots Vn\ (V)$	Parallel circuit as a current divider - Kirchhoff's current divider (combination circuits with calculations): o $IT = I1 + I2 \ldots + In\ (A)$ **Series, parallel circuits** - Calculations on combination circuits containing ➢ 1 x series and 2 x parallel ➢ 2 x series and 2 x parallel ➢ 3 x series and 3 x parallel	**Series & parallel circuits** **Practica**l: Measure voltage and current in a series or parallel circuit ➢ 1 x series and 2 x parallel ➢ 2 x series and 2 x parallel ➢ 3 x series and 3 x parallel	**Power** - Definition of Power - Power calculations: o $PT = VI\ (W)$ o $PT = I2\ R\ (W)$ o $PT = V2R\ (w)$ **Practical:** Apply power calculations to series & parallel circuits	**Simulation 1** **Design: Part 1** - Circuit diagram drawn - Component list completed	**Design: Part 1** - Circuit diagram drawn - Component list completed

TERM 1	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11
RESOURCES (OTHER THAN TEXTBOOK) **TO ENHANCE LEARNING**	Videos, PowerPoint presentations, additional notes, components, multimeter, breadboards, circuit boards, electronic software, tools and consumables										
INFORMAL ASSESSMENT, REMEDIATION	Classwork, case studies, worksheets, homework, theory and practical etc.										
SBA (FORMAL ASSESSMENT)	Assignment **PAT simulation 1 completed** The legislation governing workplaces in relation to COVID-19 is the Occupational Health and Safety Act, Act 85 of 1993, as amended, read with the Hazardous Biological Agents Regulations, Section 8 (1) of the Occupational Health and Safety (OHS) Act, Act 85 of 1993. Safe work practices are types of administrative controls that include procedures for safe and proper work used to reduce the duration, frequency, or intensity of exposure to a hazard. Examples of safe work practices for SARS-CoV-2 include requiring regular hand washing or using of alcohol-based hand rubs. Learners and teachers should always wash hands when they are visibly soiled and after removing any PPE. Keep safe distances and wear a mask at all times. See the document on the workshop safety measures.										

2023/24 ANNUAL TEACHING PLANS: ELECTRICAL TECHNOLOGY (DIGITAL ELECTRONICS): GRADE 10 (TERM 2)

TERM 2	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11
CAPS TOPIC	**Power sources**	**Power sources**	**Power sources**	**Electronic components**	**Electronic components**	**Electronic components**	**Electronic components**	**Electronic components**	**PAT consolidation and revision**	**PAT consolidation and assessment**	**PAT consolidation and assessment**
TOPICS, CONCEPTS, SKILLS AND VALUES	**Energy** - What is energy? - Primary source of energy - Sources of energy, etc **Alternative energy** - Solar - Photovoltaic cell - Solar cell vs solar panel - Generating electricity from the sun, etc	**Potential Difference (PD)** - Understanding the concept of PD o $V=EQ$ (Volt) **Electromotive Force (EMF)** - Understanding the concept of EMF - Difference between EMF and PD o $VEMF=VPD+Vr$ (Volt)	**Internal resistance** - What is Internal Resistance? - Advantages, disadvantages of internal resistance - Internal resistance calculations o $EEMF=IR+Ir$ (Volt) o $RTOTAL=R+r$ (Ω)	**Introduction of electronic components** - What are electronic components? - Purpose of electronic components **Types of components** - Switches - SPST, SPDT, DPST, DPDT - Rotary switch - Slide switches - Magnetic switches - Key switches Application and practical in simple circuits Practical: Identify, test, components	**The capacitor** - Composition, construction, functional operation symbol, characteristics curves and values - Basic principles of electrostatic charge o $Q=VC$ (Coulomb) - Time constant o $t=RC$ (Seconds) o $T=5RC$ (Seconds)	**Charging rates and time constant including curves and calculations** $Vcapacitor=Vsupply$×0.636 (Volt) o $Icapacitor=Imax$× 0.364 (Amp) - Graph - Application of capacitors in dc (examples of smoothing circuit and RC time constant) - Capacitors in series o $1CT=1C1+1C2...+1Cn$ (Farad) - capacitors in parallel o $CT=C1+C2+..Cn$ (Farad)	**Practical**: Calculation of charge: $Q=VC$ **Practical**: Calculation of total capacitance in series (2,3 and 4 capacitors) **Practical:** Calculation of total capacitance in parallel (2,3 and 4 capacitors) **Practical**: Charging characteristics of the capacitor Include drawing of graph from data	**Protective devices** - Fast blow and slow blow fuses **Diode** - Symbol - Diode as a polarised component - Forward biasing (concept only) - Reverse biasing (concept only) - Application as rectifier	**Simulation 2** **Design: Part 1** - Circuit description filled in - Tools list for circuitry populated - Learner's own - PCB planning, design included in the file	**Design: part 1** - Circuit description filled in - Tools list for circuitry populated - Learner's own - PCB planning, design included in the file	**Design: part 1** - Circuit description filled in - Tools list for circuitry populated - Learner's own - PCB planning, design included in the file
RESOURCES (OTHER THAN TEXTBOOK) **TO ENHANCE LEARNING**	Videos, PowerPoint presentations, additional notes, components, multimeter, breadboards, circuit boards, electronic software, tools and consumables										
INFORMAL ASSESSMENT, REMEDIATION	Classwork, case studies, worksheets, homework, theory and practical etc										
SBA (FORMAL ASSESSMENT)	**PAT simulation 2 completed** Controlled test Safe work practices are types of administrative controls that include procedures for safe and proper work used to reduce the duration, frequency, or intensity of exposure to a hazard. The section on tools and equipment must be infused when doing all PAT simulations.										

2023/24 ANNUAL TEACHING PLANS: ELECTRICAL TECHNOLOGY (DIGITAL ELECTRONICS): GRADE 10 (TERM 3)

TERM 3	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11
CAPS TOPICS	**Electronic components**	**Electronic components**	**Logics**	**Logics**	**Logics**	**Logics**	**Logics**	**Logics**	**Logics**	**PAT consolidation and revision**	**PAT consolidation and assessment**
TOPICS, CONCEPTS, SKILLS AND VALUES	**LED** - Symbol - LED as a polarised component Forward biasing (concept only) Reverse biasing (concept only) Current flow through and voltage across LED The series resistor o $Rseries = VT - VLedILED\ \Omega$	**Practical:** - Test the diode and LED for correct function and polarity - Calculate the value of the series resistor needed to protect an LED - Build a half wave rectifier using a diode and 50 Hz supply, etc - Build a full wave rectifier using a diode bridge (4 diodes, 2 diodes) and 50 Hz supply – Display on oscilloscope	**Introduction to logics** - Digital and analogue (explain the difference) - The use of number systems in digital electronics - Decimal to binary - Binary to decimal - Addition and subtraction of binary (test in decimal)	**Truth table & Boolean expression** (IEC and American symbols) • Basic 2 input logic functions of: ➢ NOT ➢ AND ➢ NAND (Combination of AND gate and a NOT gate)	**Truth table & Boolean expression** (IEC and American symbols) ➢ OR ➢ NOR (combination of OR and NOT) ➢ X-OR ➢ X-NOR • equivalent circuits using switches to simulate gates	**Practical: S**imulation of logic circuits using switches, relays (AND, OR) **Practical:** Simulation of logic gates using Logic IC's (AND, OR)	**Diode logic** • Principle of operation of diode logic • Equivalent circuit diagrams of logic gates using diode logic **Practical:** Simulation of logic circuits using diode logic. AND, OR, NAND, NOR, X-NOR	**Combinational circuits** • Definition of combinational circuits • Combinational circuits using 2, 3 and 4 Operands • Truth Table & Boolean Expression (IEC and American Symbols) • Basic 2 input logic functions of combinational circuits • AND, OR, NOT, NOR, NAND, XO, XNOR 4 x 2-input Gate combinations maximum	**Practical:** Simulation of combinational logic circuits using logic ICs	**Simulation 3:** **Design: Part 2** - Enclosure design completed and included in the file - Unique name written down - Logo designed - Building the enclosure and installing circuit in the enclosure	**Design: Part 2** - Enclosure design completed and included in the file - Unique name written down - Logo designed - Building the enclosure and installing circuit in the enclosure
RESOURCES (OTHER THAN TEXTBOOK) **TO ENHANCE LEARNING**		Videos, PowerPoint presentations, additional notes, components, multimeter, breadboards, circuit boards, electronic software, tools and consumables									
INFORMAL ASSESSMENT; REMEDIATION		Classwork, case studies, worksheets, homework, theory and practical etc									
SBA (FORMAL ASSESSMENT)	Term test **PAT simulation 3 completed** Safe work practices are types of administrative controls that include procedures for safe and proper work used to reduce the duration, frequency, or intensity of exposure to a hazard. The section on tools and equipment must be infused when doing all PAT simulations.										

2023/24 ANNUAL TEACHING PLANS: ELECTRICAL TECHNOLOGY (DIGITAL ELECTRONICS): GRADE 10 (TERM 4)

TERM 4	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10
CAPS TOPICS	**Principles of magnetism**	**Principles of magnetism**	**Principles of magnetism**	**Principles of magnetism**	**Principles of magnetism**	**PAT moderation and revision**	**Revision**	**Examination**	**Examination**	**Examination**
TOPICS, CONCEPTS, SKILLS AND VALUES	**Types of Inductors and Inductor cores** - Air core - Laminated core - Ferrite core - Toroid core **Demonstration:** Magnetic fields around a coil using iron filings **Demonstration:** Magnetic fields around a coil with and without a core	**Calculations:** - Coils in series (Inductor) o $Lseries$=$L1$+$L2$.....+Ln (Henry) - Coils in series (Inductor) o $Lparallel$= $1L1$+$1L2$..+$1Ln$ (Henry)	**Functional operation and application of relays, solenoids** - Symbol - Principle of operation - Construction of a relay - Parts of a relay - Normally open, normally closed	**Practical:** Testing a relay using a multimeter **Demonstration:** Wire a relay and light to a switch and operate the relay **Demonstration:** Latching circuit with a relay	**Introduction to a simple series DC motor** - Basic parts of a DC motor - Current flow in a DC motor and direction of rotation - Fleming's Right-Hand Rule - Armature - Yoke, magnetic poles - Bearings, brushes in endplates - Brushes - Communication **Demonstration**: Show how the direction of rotation in DC motors can be changed	Finalising PAT portfolio and project for moderation in the workshop Revision term 1 and term 2 content	Revision term 3 and term 4 content			
RESOURCES (OTHER THAN TEXTBOOK) **TO ENHANCE LEARNING**	Videos, PowerPoint presentations, additional notes, components, multimeter, breadboards, circuit boards, electronic software, tools and consumables									
INFORMAL ASSESSMENT; REMEDIATION	Classwork, case studies, worksheets, homework, theory and practical, etc.									
SBA (FORMAL)	Examination									