basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

2023/24 ANNUAL TEACHING PLANS: ELECTRICAL TECHNOLOGY (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, assessment**	**PAT consolidation, revision, assessment**
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 - 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, 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 - Fish tape, draw wire - Bending spring **Safe use and care of instruments** (These skills will be practiced in this week and honed throughout the year) - Continuity tester - Analog multimeter (focus on demonstration) - Digital multimeter - Megger, insulation tester - 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) **(Measuring instruments and related tools to be incorporated when doing the practical - Ohm and multimeter)**	**Ohm's 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, parallel circuit ➢ 1 x series and 2 x parallel ➢ 2 x series and 2 x parallel ➢ 3 x series and 3 x parallel **(Measuring instruments and related tools to be incorporated when doing this practical – Volt, Amp, Ohm and multimeter)**	**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 **PAT** **simulation 1** **(Measuring instruments and related tools to be incorporated when doing this practical – Volt, Amp, Ohm and multimeter)**	**PAT** finalising simulation 1 Manufacture a simple continuity tester on a Veroboard **PAT project** Design part 1: Circuit diagram, component list	**PAT** finalising simulation 1 **PAT PROJECT** Design part 1: Circuit diagram, component list

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 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 (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, revision**	**PAT consolidation, revision, assessment**	**PAT consolidation, revision, assessment**
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 - Reasons for using regulators - Reasons for using batteries with solar panels - Block diagram of a solar electricity generation system for domestic use	**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 V_{EMF}=VPD+Vr (Volt)	**Internal resistance** - What is internal resistance? - Advantages, disadvantages of internal resistance - Internal resistance calculations o E_{EMF}=IR+Ir (Volt) o R_{TOTAL}=R+r (Ω) **Practical:** Calculate internal resistance of a cell, battery in series with a resistor	**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, measure different electronic components **(Measuring instruments and related tools to be incorporated when doing this practical – Volt, Amp, Ohm and multimeter)**	**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 1, CT=1, $C1$+1, $C2$...+1, Cn (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 **(Measuring instruments and related tools to be incorporated when doing this practical – Volt, Amp, Ohm and multimeter)**	**Protective devices** - Fast blow and slow blow fuses **Diode** - Symbol - Diode as a polarised component - Forward biasing (concept only) - Reverse biasing (concept only) - Current flow through the diode - Voltage across the diode - Application as a rectifier	**PAT** Finalising simulation 2 **PAT project design part 2:** Circuit description tool list Learner's own PCB planning, design	**PAT** Finalising simulation 2 **PAT project design part 2:** Circuit description tool list Learner's own PCB planning, design	**PAT project design part 2:** Circuit description tool list Learner's own PCB planning, design
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**										**Controlled test**
	PAT simulation 2 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 (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 TOPIC	**Electronic components**	**Electronic components**	**Communication systems**	**Communication systems**	**Communication systems**	**Communication systems**	**Principles of magnetism**	**Principles of magnetism**	**Principles of magnetism**	**PAT consolidation, revision, assessment**	**PAT consolidation, revision, assessment**
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 $Rseries = VT - VLed, ILED\ \Omega$	**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, display on oscilloscope - Build a full wave rectifier using a diode bridge (4 diodes, 2 diodes) and 50 Hz supply – display on oscilloscope	**Introduction to communication systems** - Purpose of communication systems - Types of communication systems (what are they?) - Commercial broadcasting (SABC, FM Radio and DSTV, etc.) - Commercial communication (telephone systems, security companies, air traffic control, cell phones, etc.) - Community communication (disaster management, emergency services, amateur radio, research, etc.) - Internet communication - Computer networks	**Radio communication – basic concepts of**: - A radio - An electromagnetic radio wave - Transmitter - Receiver - Feed line - Antenna - Interference & electromagnetic compatibility	**Principles of modulation** - Frequency - Wavelength - Speed of radio frequency - Units of frequency	**Radio antenna** - The relationship between frequency and wavelength – no calculation - Types of radio antenna - Omni-directional antenna ¼ ʎ - Dipole ½ ʎ - Directional antenna – Yagi-Uda array - Standing wave - Radio (SWR) good vs bad SWR - Antenna gain (gain over an isotropic antenna)	Introduction to magnetism - Define magnetism e.g., natural, electro-magnetism - Basic principles of magnetism - Rules of magnetism **Demonstration:** Magnetic fields around a permanent magnet using iron filings	Magnetic fields concepts of: - Magnetic flux (ø) - Flux density (β) - Inductance (L) - Definition of inductor - No calculation **Demonstration:** Oersted's experiment (screwdriver rule)	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	**PAT** finalising simulation 3 **PAT project phase 2** Building enclosure and installing circuit into enclosure **Test**	**PAT** finalising simulation 3 **PAT project Phase 2** Building enclosure and installing circuit into enclosure **Test**
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 (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 TOPIC	**Principles of magnetism**	**Principles of magnetism**	**Principles of magnetism**	**Principles of magnetism**	**Principles of magnetism**	**PAT consolidation and revision**	**PAT consolidation and revision**	**Examination**	**Examination**	**Examination**
CONCEPTS, SKILLS AND VALUES	Calculations: - Coils in series (inductor) o $Lseries$=$L1$+$L2$.....+Ln (Henry) - Coils in series (inductor) o $Lparallel$= 1$L1$+1$L2$..+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 **Practical:** 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 - Commutation **Demonstration:** Show how the direction of rotation in DC motors can be changed	**PAT:** Finalising PAT portfolio and project for moderation **Revision:** Term 1 & 2 content	**PAT:** Finalising PAT portfolio and project for moderation **Revision:** Term 3 & 4 content			
RESOURCES (OTHER THAN TEXTBOOK) **TO ENHANCE LEARNING**	Videos, PowerPoint presentations, additional notes, components, multimeter, breadboards, circuit boards, electronic software tools and consumables									
SBA (FORMAL ASSESSMENT	**Final examination**									