



2023/24 ANNUAL TEACHING PLANS: ELECTRICAL TECHNOLOGY (POWER SYSTEMS): 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
CONCEPTS, SKILLS AND VALUES	Responsibilities <ul style="list-style-type: none"> - What are your rights in the workshop? - What are your responsibilities in the workshop? General workshop rules <ul style="list-style-type: none"> - Housekeeping (health hazards, safety hazards, workshop layout, workshop management) Workshop safety <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - Placement of the master switch - Critical versus non-critical emergencies - Medical emergencies - Electrical shock, electrocution procedures - Evacuation procedures - Principles of fire fighting 	Basic first aid <ul style="list-style-type: none"> - 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) <ul style="list-style-type: none"> - 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, care, correct and safe use of the following tools: <ul style="list-style-type: none"> - Screwdrivers (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) - Hacksaw (junior hack saw) - Breadboard - Fish tape, draw wire - Bending spring Practical skills and techniques <ul style="list-style-type: none"> - Safe and correct use of tools - Continuity tester - Analogue multimeter (focus on demonstration) - Digital multimeter - Megger insulation tester - The oscilloscope (teacher to set up an instrument) 	Atomic theory <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - 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) 	Ohm's Law Ohm's Law: $V=IR$ (Ω) <ul style="list-style-type: none"> - Verify Ohm's Law with calculations - Pay attention to prefixes and unit conversions Series circuit as voltage divider <ul style="list-style-type: none"> - Kirchhoff's Voltage Divider: $\sum V_T = V_1 + V_2 + \dots + V_n$ (V) 	Parallel circuit as a current divider <ul style="list-style-type: none"> - Kirchhoff's current divider (combination circuits with calculations): $\sum I_T = I_1 + I_2 + \dots + I_n$ (A) 	Series, parallel circuits <ul style="list-style-type: none"> - Calculations on combination circuits containing <ul style="list-style-type: none"> > 1 x series and 2 x parallel > 2 x series and 2 x parallel > 3 x series and 3 x parallel Practical: Measure voltage and current in a series, parallel circuit <ul style="list-style-type: none"> > 1 x series and 2 x parallel > 2 x series and 2 x parallel > 3 x series and 3 x parallel Usage of a multimeter	Power <ul style="list-style-type: none"> - Definition of power - Power calculations: <ul style="list-style-type: none"> o $PT = VI$ (W) o $PT = I^2 R$ (W) o $PT = V^2/R$ (w) Practical: Apply power calculations to series, parallel circuits	Simulation 1 Design: Part 1 <ul style="list-style-type: none"> - Circuit diagram drawn - Components lists completed 	<ul style="list-style-type: none"> - Circuit diagram drawn - Components lists 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
	Practical: Perform an evacuation exercise for the workshop										
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 (POWER SYSTEMS): 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
CAPS TOPIC	Power sources	Electronic components	Electronic components	Electronic components	Electronic components	Domestic installations	Domestic installations	Domestic installations	PAT consolidation, revision and assessment	PAT consolidation, revision and assessment
CONCEPTS, SKILLS AND VALUES	<p>Energy</p> <ul style="list-style-type: none"> - What is energy? - Primary source of energy - Sources of energy, (wind, sun, coal, nuclear, geothermal, hydro) <p>Alternative energy</p> <ul style="list-style-type: none"> - Solar, photovoltaic cell - Solar cell vs solar panel - Generating electricity from the sun - Potential difference and electromotive force) - Understanding the concept of PD <p>$V = \frac{E}{Q}$ (Volt)</p> <p>Electromotive Force (EMF)</p> <ul style="list-style-type: none"> - Understanding the concept of EMF - Difference between EMF and PD <p>$V_{EMF} = IR + Ir$ (Volt)</p> <p>$R_{Total} = R + r$ (Ω)</p>	<p>Introduction of electronic components</p> <ul style="list-style-type: none"> - What are electronic components? - Purpose of electronic components, etc. <p>Types of components</p> <ul style="list-style-type: none"> - Switches - SPST, SPDT, DPST, DPDT - Rotary switch - Slide switches • Magnetic switches • Key switches • Application and practical in simple circuits <p>Practical: Identify, test Measure different electronic components</p>	<p>The capacitor</p> <p>Composition, construction, function, operation, symbol, characteristics curves and values</p> <p>Basic principle of electrostatics charge</p> <p>$Q = CV$ (Coulomb)</p> <p>Capacitors in series</p> <p>$\frac{1}{CT} = \frac{1}{c1} + \frac{1}{c2} + \frac{1}{c3} \dots \frac{1}{cn}$</p> <p>Capacitors in parallel</p> <p>$CT = C1 + C2 + C3 \dots Cn$ (Farrads)</p>	<p>Practicals on the capacitor</p> <p>Practical: Calculation of charge: $Q = CV$</p> <p>Practical: Calculation of total capacitance in series (2.3 and 4 capacitors)</p> <p>Practical: Calculation of total capacitance in parallel. (2.3 and 4 capacitors)</p> <p>Practical: Charging the characteristics of the capacitor, include drawing the graph from the data</p>	<p>Protective devices, fast blow and slow blow fuses</p> <p>Diode</p> <ul style="list-style-type: none"> - 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 <p>LED</p> <ul style="list-style-type: none"> - Symbol - LED as a polarised component - Forward biasing (concept only) - Reverse biasing (concept only) - Current flow through the diode - Voltage across the LED - The series resistor <p>$R_{series} = \frac{VT - V_{LED}}{I_{LED}}$ (Ω)</p> <p>Practical:</p> <ul style="list-style-type: none"> - 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. 	<p>Electrical energy distribution - supplier to the consumer</p> <ul style="list-style-type: none"> - Domestic installations - Sequence of connection from the supplier to consumer-block-diagram - SANS 10142-1 installation regulations ➤ Aim of the SANS 10142-1-low voltage installations ➤ Chapter 3 definitions ➤ Chapter 5 fundamental requirements ➤ Chapter 5.1 safety ➤ Chapter 5.2 basic provisions 	<p>Identification of the parts, functions, care, correct and safe use of the following tools:</p> <ul style="list-style-type: none"> - Screwdrivers (flat and Phillips) - Files (flat, square, round, triangular and half round) - Side cutter - Long-nosed pliers - Combination pliers <p>Practical skills and techniques</p> <ul style="list-style-type: none"> - Safe and correct use of tools 	<p>The distribution board</p> <ul style="list-style-type: none"> - Wiring diagram DB board - Distribution board wiring principles - SANS chapter 6.6.1-distribution boards: General - SANS chapter 6.6.2-distribution boards: Bus bars - SANS chapter 6.7 – protection - SANS chapter 6.10 – fuses <p>Protective devices: Miniature circuit breakers</p> <ul style="list-style-type: none"> - Principle of operation - Electromagnetic type - Thermal type - Ratings - SANS chapter 6.8 – circuit breakers - SANS chapter 6.9 – disconnecting devices <p>Practical: Wire a distribution board according to the SANS requirements</p>	<p>Simulation 2 Design: Part 1</p> <ul style="list-style-type: none"> - Circuit description filled in - Tool list for circuitry populated - Learner's own PCB planning, design included in file 	<ul style="list-style-type: none"> - Circuit description filled in - Tool list for circuitry populated - Learner's own PCB planning, design included in file
RESOURCES (OTHER THAN TEXTBOOK) TO ENHANCE LEARNING	Videos, PowerPoint presentations, additional notes, components, multimeter, breadboards, circuit boards, electronic software tools and consumables									

TERM 2	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10
INFORMAL ASSESSMENT, REMEDIATION	Classwork, case studies, worksheets, homework, theory and practical etc									
SBA (FORMAL ASSESSMENT)	Term 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.									

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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	Domestic installations	Domestic installations	Domestic installations	Domestic installations	Domestic installations	Principles of magnetism	Principles of magnetism	PAT (project) consolidation	PAT (project) consolidation	Revision	Assessment
CONCEPTS, SKILLS AND VALUES	<p>Protective devices: Earth leakage</p> <ul style="list-style-type: none"> - Principle of operation - Safety considerations - Cabling and cable sizes - Correct identification and fitting of wiring for domestic installation - Cable termination - Glands (PVC pressure glands) <p>Acknowledgement of indigenous knowledge systems (Pratley connector boxes)</p>	<p>Pipe sizes</p> <ul style="list-style-type: none"> - Bending, fitting, sawing - PVC conduit and fittings <p>Practical: Install PVC piping for the domestic circuits</p> <p>Protective devices earthing</p> <ul style="list-style-type: none"> - The earth spike, lightning arrestor, earth systems and bonding (acknowledgement of indigenous knowledge systems) (Earth leakage developed in SA) - SANS Chapter 6.11 – Consumers earth terminal - SANS Chapter 6.12 – Earthing - SANS Chapter 6.13 - Bonding <p>PAT: Assembly and soldering of components on PC board</p>	<p>Safe use and care of instruments</p> <ul style="list-style-type: none"> - Continuity tester - Analogue multimeter (focus on demonstrations) - Digital multimeter - Megger, insulation tester - Polarity tests (plug tester) <p>Practical: Wire a lighting sub-circuit with two way and intermediate switching</p>	<p>Sub-circuits Lighting circuit</p> <p>Lights in series (voltage and current measurement)</p> <p>Lights in parallel (voltage and current measurement)</p> <p>Use of the multimeter</p> <p>Testing and troubleshooting (after installation)</p> <ul style="list-style-type: none"> - Earth continuity testing - Insulation resistance tests between conductors - Insulation resistance tests between conductors and earth 	<ul style="list-style-type: none"> ➤ Two-way switching (SPDT) ➤ Intermediate light switching (DPDT) <p>Plug circuits</p> <p>SANS chapter 6.15 – socket outlets</p> <p>Practical: Wire two plugs into a sub-circuit</p> <p>Testing and troubleshooting (after installation)</p> <ul style="list-style-type: none"> - Earth continuity testing - Insulation resistance tests between conductors - Insulation resistance tests between conductors and earth 	<p>Introduction to magnetism</p> <p>Define magnetism e.g.</p> <ul style="list-style-type: none"> - Natural - Electromagnetism <p>Basic principle of magnetism</p> <p>Rules of magnetism</p> <p>Practical: Magnetic field around the permanent magnet using iron filings</p>	<p>Magnetic fields</p> <p>Concepts of:</p> <ul style="list-style-type: none"> - Magnetic flux - Flux density - Inductance - Definition of inductor (no calculations) <p>Demonstration: Oersted’s experiment (screwdriver rule)</p>	<p>Simulation 3: Design: Part 2</p> <ul style="list-style-type: none"> - Enclosure design completed and included in the file - Unique name written down - Logo designed - Building the enclosure and installing in the enclosure 	<p>Simulation 3: Design: Part 2</p> <ul style="list-style-type: none"> - Enclosure design completed and included in the file - Unique name written down - Logo designed - Building the enclosure and installing in the enclosure building the enclosure and installing 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										
	<p>PAT simulation 3 completed</p> <p>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.</p> <p>The section on tools and equipment must be infused when doing all PAT simulations.</p>										

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TERM 4	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10
CAPS TOPIC	Domestic installations	Principles of magnetism	Principles of magnetism	Principles of magnetism	Principles of magnetism	PAT moderation and revision	Revision	Examination	Examination	Examination
CONCEPTS, SKILLS AND VALUES	<p>Practical: Do an insulation resistance test on the domestic installation</p> <p>Practical: Do a polarity test on the live domestic installation</p> <p>PAT project completed and moderated</p>	<p>Types of inductors and inductor cores</p> <ul style="list-style-type: none"> - Air core - Laminated core - Ferrite core - Torroid core <p>Demonstration: Magnetic fields around a coil using iron filings</p> <p>Demonstration: Magnetic fields around a coil with and without a core</p>	<p>Calculations:</p> <ul style="list-style-type: none"> - Coils in series (Inductor) o $L_{series} = L1 + L2 + \dots + Ln$ (Henry) - Coils in series (Inductor) o $L_{parallel} = \frac{1}{\frac{1}{L1} + \frac{1}{L2} + \dots + \frac{1}{Ln}}$ (Henry) <p>Functional operation and application of relays, solenoids</p> <ul style="list-style-type: none"> - Symbol - Principle of operation - Construction of a relay - Parts of a relay - Normally open, normally closed 	<p>Practical: Testing a relay using a multimeter</p> <p>Demonstration: Wire a relay and light to a switch and operate the relay</p> <p>Demonstration: Latching circuit with a relay</p>	<p>Introduction to a simple series DC motor</p> <ul style="list-style-type: none"> - 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 <p>Demonstration: Show how the direction of rotation in DC motors can be changed</p>	<p>Finalising PAT portfolio and project for moderation in the workshop</p> <p>Revision of term 1 and term 2 content</p>	<p>Revision of term 2 and term 3 content</p>			
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									