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National Revised ATP: Term 1Grade 11 Electrical Technology: Power Systems 2021

TERM 1 (45 days)	Week 1 27 - 29 January (3 days)	Week 2 1 - 5 February	Week 3 8 - 12 February	Week 4 15 - 19 February	Week 5 - 9 22 February – 26 March	Week 6 1 – 5 March	Week 7 8 – 12 March	Week 8 15 – 19 March	Week 9 22 -26 March	Week 10 29 - 31 March (3 days)
CAPS Topics	**OHS**	**OHS**	DC Machines	DC Machines	**DC Machines**	**DC Machines**	**Single Phase AC Generation**	**Single Phase AC Generation**	**Single Phase AC Generation**	
Topics /Concepts, Skills and Values	**OHS** •Basic introduction to regulations What are regulations? How to use regulations? Impact of regulations on the workshop Introduction and purpose of the regulations •General Machinery Regulation 1988 Supervision of machinery Safeguarding of machinery Operation of machinery Working on moving or electrically alive machinery Devices to start and stop machinery Reporting of incidents in connection with machinery •Electrical Machinery Regulations 1988 Safety equipment Electrical control gear Switchboards	**OHS** Safety •What is ergonomics •(Workplace conditions / comfort – Everything has a place and everything is in its place) •Unsafe actions •Unsafe conditions •Dangerous practices •Housekeeping principles Signs in the workshop •Information signs •Safety signs •Prohibition signs •Fire Safety signs PAT: Teacher hands out design and Make section of PAT project and simulations to learners. He/she obtains quotations for PAT projects and submit to SMT. Principal approves procurement of PAT projects resources.	Introduction to DC Machines •Difference between generators and motors •Revision of the DC motor working principle in Grade 10 Construction of DC Machine •Armature •Commutation •Brushes •Yoke •Name Plate •Field windings •Lap •Wave Purpose of components / parts of the DC Machine •Armature •Commutation •Brushes •Yoke •Field windings •Pole pairs •Inter-poles	Practical: identify the parts of the motor Principle of operation of the DC Machine •Armature reaction •Reducing armature reaction	Principle of operation of the DC Machine •Commutation •Improving of commutation Practical: Perform insulation resistance test and continuity test on motor windings Types of DC Machine Series, shunt and compound machines Application of each type Relationship between speed and torque Characteristics curves (Effect of changes in load on speed and torque)	The Stepper Motor Field poles • Basic working principles • Servo Motors • Basic working principles • Characteristics curves (Effect of changes in load on speed and torque) • Speed control done through electronics – Pulse width modulation (concept only) • PAT: Teacher ensures that there is secure storage for PAT projects, hands out and takes in PAT projects and includes practical sessions for learners to complete PAT project every week. Learners Commence with completion of the PAT project. HOD checks on teacher to ensure that practical workshop sessions take place on a weekly basis.	**Introducing Single Phase AC Generation** •Difference between DC and AC •Motivation for using AC rather than DC •Generation of a single phase supply by rotating a conductor loop through a two-pole magnetic field **Laws of Electricity** •Faraday's Law •Fleming's Right Hand Generator Rule •Fleming's Left Hand Motor Rule (Revision) Function Generator and Oscilloscope External parts and their functions Principle of operation Application Care Maintenance Demonstration: Rotate magnetic field through a coil and display on Oscilloscope.	• The Sinusoidal Waveform • Instantaneous value (Calculations) • ω=2πf (radians) • θ=wt (degrees) • i=I_max×sinθ (A) • v=V_max×sinθ (V) • Maximum value (Calculations) • $V_{max}=V_{RMS}\times1.414$(V) • RMS value (No Mid-ordinate Rule) (Calculations) • $V_{RMS}=V_{max}\times0.707$ (V) • Average value over half cycle (Calculations) • V_average=V_max×0.637 (V)	Calculation of: • Instantaneous value • $v = V_m Sin\theta\ (Volts)$ • Maximum value • $V_m = 2\pi\beta AnN\ (Volts)$ • $E = \beta lv\ (Volts)$ • RMS value • $V_{RMS} = V_m \times 0.707\ (Volts)$ • Average value over half cycle (Mid-ordinate rule to show where average value comes from) • $V_{average} = V_m \times 0.637\ (Volt$	Completion of simulation 1

		Portable electric tools Earthing Conductors	Teacher ensures that PAT							
Requisite pre-knowledge		Introduction of the OHS Act, Electrical Machinery Regulations		Electromagnetism and working principle of DC Motor			Introduction to magnetism and basic power sources. Use of multimeter and Clamp meter			
Resources (other than textbook) **to enhance learning**		OHS act Safety signs in workshop First aid training manuals		You Tube video clips and related IT resources Old question papers			You Tube video clips and related IT resources Old question papers			
Assessment	**Informal Assessment:** Remediation	Classwork/case studies/worksheets/homework/class tests (Theory and practical work)								
	SBA & PAT (Formal)	**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.									

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National Revised ATP: Term 2 Grade 11 Electrical Technology: Power Systems 2021

TERM 2 (51 days)	Week 1 13 – 16 April (4 days)	Week 2 19 – 23 April (5 days)	Week 3 28 – 30 April (3 days)	Week 4 3 – 7 May (5 days)	Week 5 10 – 14 May (5 days)	Week 6 17 – 21 May (5 days)	Week 7 24 -28 May (5 days)	Week 8 31May - 4 June (5 days)	Week 9 7 – 11 June (5 days)	Week 10 14 – 18 June (4 days)	Week 11 21 – 25 June (5 days)
CAPS Topics	Single Phase Transformers	Single Phase Transformers	Single Phase Transformers	Single Phase Transformers	RLC	RLC	RLC	**RLC**	**Simulation 2**	**Consolidation**	**Consolidation**
Topics /Concepts, Skills and Values	**Introduction to Transformers** •Magnetic Induction •Lenz's Law •Magneto magnetic force •Self and mutual inductance •Function and operation of transformers	•Losses in Transformers (No calculations) •Advantages and disadvantages •Construction and symbols of the transformer and core types Application of an ideal transformer	**Calculations related to Transformers** • Power calculations Full load ○ $P = VI\cos\theta\ (Watt)$ VA ratings ○ $S = VI\ (VA)$ • Primary and secondary voltage / current 0%	• Ratio calculations • $\frac{V_{input}}{V_{output}} = \frac{N_{input}}{N_{output}} = \frac{I_{output}}{I_{input}}$ • Efficiency $\eta = \frac{P_{output}}{P_{input}} \times 10$	**Effects of Alternating Current on Resistor, Inductors and Capacitors (RLC)** Components in series only All applicable calculations relevant to the theory to be completed Emphasis will be on circuits containing ONE resistor, ONE capacitor and ONE inductor. Wave representation	Phasor diagram Inductance reactance • $X_L = 2\pi fL$ Capacitance reactance • $X_C = \frac{1}{2\pi fC}$ Effects of frequency on X_L and X_C. **Demonstration:** Show phase difference between RL and RC	Impedance • $Z = \sqrt{R^2 + (X_L - X_C)^2}$ (Ω) • Scalar: Representation of the impedance Triangle • Power • $P = V \times I \cos\theta$ (Watt)	Power Factor • $Cos\ \theta = \frac{R}{Z}$ • $Cos\ \theta = \frac{V_R}{V_Z}$ Phase Angle • $\theta = \cos^{-1}\frac{R}{Z}$ (Deg) • $\theta = \cos^{-1}\frac{V_R}{V_Z}$ (Deg)	Completion of simulation 2	Consolidation of term 2 work	Consolidation of term 2 work
Requisite pre-knowledge	Basic electronic components and principles of magnetism				Basic electronic components and principles of magnetism						
Resources (other than textbook) **to enhance learning**	You Tube video clips and related IT resources Old question papers				You Tube video clips and related IT resources Old question papers				RLC "spook box" simulation	Old question papers	Old question papers
Assessment — **Informal Assessment:** Remediation	Classwork/case studies/worksheets/Homework (Theory and practical work)										
Assessment — **SBA & PAT (Formal)**	**Term test** **PAT simulation 2 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.										

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National Revised ATP: Term 3 Grade 11 Electrical Technology: Power Systems 2021

TERM 3 (52 days)	Week 1 13 – 16 July (4 days)	Week 2 19 – 23 July (5 days)	Week 3 26 – 30 April (5 days)	Week 4 2 – 6 August (5 days)	Week 5 9 – 13 August (4 days)	Week 6 16– 20 August (5 days)	Week 7 23 -27 August (5 days)	Week 8 30 August – 3 Sept (5 days)	Week 9 6 - 10 Sept (5 days)	Week 10 13 - 17 Sep (5 days)	Week 11 20 - 23 Sept (4 days))
CAPS Topics	**Control Devices**	**Control Devices**	**Control Devices**	**Control Devices**	**Control Devices**	**Control Devices**	**Single Phase Motors**	**Single Phase Motors**	**Single Phase Motors**	**simulation 3**	**Consolidation**
Topics /Concepts, Skills and Values	**Introduction to Control and Protection of AC Machines** • Principle of operation of protection (Theory session) ➢ Overcurrent and undervoltage protection ➢ Re-settable overcurrent protection (Motor protection) ➢ The Zero Volt Coil / No Volt Coil (Operator protection)	**The Direct On Line Starter / Contactor (DoL)** • Identification, operation and purpose of: ➢ The contactor ➢ Start button ➢ Stop button ➢ Overload protection ➢ On Delay Timer / Off Delay Timer • Setting overcurrent protection ○ $I_{overcurr}$ $I_{max} \times$ 125% (• Wiring diagram of the DoL Testing and commisioning	Practical: Connecting a DoL starter to a light switch	**Introduction to the Programmable Logic Control Device (PLC)** • History of the PLC • What is hardware? • What is software? • Hard wiring vs. Soft wiring • The programmed scan cycle of a PLC (Input, process, output) • Safety and PLC devices	**PLC Software – Introduction on the Computer** • The purpose of using software to program the PLC • Navigating the Graphic User Interface of the programming software used (How to use software) • Using Ladder Logic to write a program for a PLC • What is a rung? • Ladder Logic symbols • Inputs • Outputs • Inverting inputs and outputs • AND / OR / NOT function • Latching concepts in Ladder Logic • Retaining contact • interlocking	Practical: Program a PLC as a DoL starter	**Single Phase Induction Motors** • The Universal Motor • Construction of the AC motor • Comparison between AC and DC motors • Producing a rotating magnetic field in single phase motors • Considerations when selecting a motor to suit a load • How changes in load affects the speed of a motor • Operation of split phase motors (Methods of splitting single phase supply)	**Capacitor Start Motor** (Note: This is a practical component – all aspects will attended to as part of the practical work in the workshop in conjunction with the theory) • Function of components • Diagram (Interprete the circuit diagram and wire the starter and motor on a panel) • Reversal of direction of rotation (Add practical session on reversal of direction)	**Capacitor Start Motor** • Testing a motor • Visual inspection test • Insulation • Continuity of windings • Test earth continuity • Mechanical test • Practical application & use: connection of a CSM • Wire DoL to motor • Start and stop motor Demonstration only	Completion of simulation 3	Consolidation of term 3 work
Requisite pre-knowledge											
Resources (other than textbook) **to enhance learning**											
Assessment — **Informal Assessment:** Remediation	Classwork/case studies/worksheets/Homework (Theory and practical work)										
Assessment — **SBA & PAT (Formal)**	**Term Test** **PAT simulation 3 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.										

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2021 Annual Teaching Plan – Term 4:

TERM 4 (47 days)	Week 1 5 – 8 Oct (4 days)	Week 2 11 - 15 Oct (5 days	Week 3 18 - 22 Oct (5 days)	Week 4 25 - 29 Oct (5 days)	Week 5 1 - 5 Nov (5 day)s	Week 6 1 - 5 Nov (5 days)	Week 7 8 - 12 Nov (5 days)	Week 8 15 - 19 Nov (5 days)	Week 9 22 - 26 Nov (5 days)	Week 10 29 - 3 Dec (5 days)	Week 11 6 - 8 Nov (3 days)
CAPS Topics	**Power supplies**	**Power supplies**	**Power supplies**	**Power supplies**	**Power supplies**	**Power supplies**	**Power supplies**	**Consolidation**	**PAT moderation**	Examination	Examination
Topics /Concepts, Skills and Values	**DC Power Supplies** • What is a power supply unit (PSU)? • Block diagram of a linear power supply • The role that different semiconductor components play in a PSU • **Semiconductors** ➢ The PN Diode ✓ Construction	**DC Power Supplies** Principle of operation Electron flow vs. conventional flow P & N material	• Forward Biasing • Reverse Biasing • Characteristics curve & symbol of the diode	**DC Power Supplies** • **Practical:** Construct a half wave rectifier and display the waveform on the Oscilloscope	**Rectification (Half Wave and Full Wave)** • Waveforms • Circuit construction (Practical) • Representation of waves on Oscilloscope • Principle of filtering and waveforms	• Block diagram • Circuit construction of the C and LC Filter (Practical) • Representation of waves on Oscilloscope • Ripple Factor – percentage only	**Practical:** Construct a full wave rectifier and display the waveform on the Oscilloscope				
Requisite pre-knowledge	Introduction to basic electronic components, basic operation,										
Resources (other than textbook) **to enhance learning**	You Tube video clips, related IT resources and simulations Old question papers										
Assessment — **Informal Assessment:** Remediation	Classwork/case studies/worksheets/homework/class tests (Theory and practical work)										
Assessment — **SBA (Formal)**	**Examinations**										