

National Revised ATP: Term 1 Grade 11 Electrical Technology: Electronics 2021

TERM 1 (45 days)	1: 27-29 Jan (3)	2: 01-05 Feb (5)	3: 08-12 Feb (5)	4: 15-19 Feb (5)	5: 22-26 Feb (5)	6: 1-5 March (5)	7: 8- 12 March Feb (5)	8: 15-19 Mar (5)	9: 23-26 Mar (4)	10: 29-31 Mar (3)
CAPS topic	Occupational Health and Safety	Waveforms	Waveforms	Waveforms	Waveforms	RLC	RLC	RLC	PAT Consolidation	Revision
Concepts, skills and values	<ul style="list-style-type: none"> Basic introduction to regulations General Machinery Regulations 1988 Electrical Machinery Regulations 1988 <p>Safety</p> <ul style="list-style-type: none"> What is Ergonomics? Unsafe actions Unsafe conditions Dangerous practices Housekeeping principles Signs in the workshop etc.... <p>Personal Safety</p> <ul style="list-style-type: none"> Protective gear for machinery Personal protection equipment Eye protection Coveralls / Overalls Hearing protection <p>Practical: Use personal protection equipment (During practical sessions)</p> <p>Chemical Safety (Printed Circuit Board manufacturing)</p> <ul style="list-style-type: none"> Revision of Grade 10 PCB methods and safety <p>Practical: Etch a PCB (Part of PAT completion)</p>	<p>Introduction to Waveforms</p> <ul style="list-style-type: none"> Uses of waveforms Different types of waves Waveforms and their applications Square Wave Saw tooth Wave Triangular Wave Rectangular Wave Radio Wave <p>Definition, Symbol & Unit of:</p> <ul style="list-style-type: none"> The Sinusoidal Wave Instantaneous value Maximum value / Minimum value Peak to peak value RMS value $V_{rms} = 0.707 \times E_m$ Average value over half cycle ($V_{avg} = V_{max} \times 0.637$) Time period Frequency Duty cycle Form factor Concept of Phase and Phase difference Harmonic frequencies (Concept only) Difference between a sound wave and an electromagnetic wave (Concept only – self propagating vs. medium needed) Electromagnetic waves (Concept only – combination of 	<p>Pulse Technique</p> <ul style="list-style-type: none"> Pulse polarity Pulse time Rise time / Fall time What is a clock pulse, leading edge, trailing edge? <p>Calculations</p> <ul style="list-style-type: none"> Pulse time Pulse frequency Rise time Fall time Period and frequency λ (wavelength) & frequency <p>Practical: Set up and measure different waveforms generated by the function generator on the Oscilloscope</p>	<p>Wave Shaping Circuits</p> <ul style="list-style-type: none"> Diode using discrete components only Clipping Circuits (Positive Clipping only) Simple Series Series Biased Simple Parallel Biased Parallel 	<ul style="list-style-type: none"> Clamping Circuits (Positive clamping only) Clamping Circuit – Diode Clamping Circuit – Zener Diode Integrator & Differentiator No calculations Input and output waveforms on oscilloscope Construction on breadboard Measurement of output waveform <p>Practical: Construct each type of clipping and clamping circuit on breadboard using diodes</p>	<p>Effect of Alternating Current on Resistors, Inductors and Capacitors (RLC)</p> <ul style="list-style-type: none"> Components in series circuits 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 Inductive Reactance $X_L = 2\pi fL (\Omega)$ Capacitive Reactance $X_C = \frac{1}{2\pi fC} (\Omega)$ Effect of frequency changes on XL and XC <p>Demonstration: Show phase difference between RL and RC</p>	<ul style="list-style-type: none"> Impedance $Z = \sqrt{R^2 + (X_L - X_C)^2} (\Omega)$ Scalar: Representation of the Impedance Triangle Power $P = V \times I \cos \theta (Watt)$ Power Factor $\cos \theta = \frac{R}{Z}$ Phase Angle $\theta = \cos^{-1} \frac{R}{Z} (Deg)$ Phase Angle $\theta = \cos^{-1} \frac{V_R}{V_Z} (Deg)$ Effect of frequency changes on the impedance and current flow Resonance with its characteristic curves Q Factor Bandwidth Frequency changes <p>Calculations</p> <ul style="list-style-type: none"> Series combination circuits containing ONE resistor, ONE capacitor and ONE inductor Phasor and wave representation Resonance Bandwidth Q Factor 			

		<p>electrical and magnetic wave – unique characteristics)</p> <ul style="list-style-type: none"> •Speed of Radio waves •Frequency and wavelength <p>Demonstration: Function Generator and the Oscilloscope used to measure and display waveforms</p>								
Resources (other than textbook) to enhance learning	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	
Informal assessm; remediation	Classwork / Case studies / Worksheets / Homework / Theory and Practical etc.)									
SBA (Formal Assessment)	<p style="text-align: center;">Assignment PAT simulation 1 completed</p> <p>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,</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. 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.</p>									

National Revised ATP: Term 2 Grade 11 Electrical Technology: Electronics 2021

TERM 2 (51 days)	1: 13-16 Apr (4)	2: 19-23 Apr (5)	3: 26-30 Apr (4)	4: 03-07 May (5)	5: 10-14 May (5)	6: 17-21 May (5)	7: 24-28 May (5)	8: 31 May -4 June (5)	9: 07-11 June (5)	10-11: 14-25 June (9 day)
CAPS topic	Semiconductor devices	Semiconductor devices	Semiconductor devices	Semiconductor devices	Semiconductor devices	Semiconductor devices	Semiconductor devices	Semiconductor devices	PAT Consolidation	Revision
Concepts, skills and values	Introduction to Semiconductor Devices <ul style="list-style-type: none"> •Component data •Where to source data on all types of electronic components •How to read a data sheet •Pin configuration •Typical operating values •Working temperature •Equivalent components •Packages (Dual In Line, TO 92, basic packages) •Through-hole components vs. surface mount devices Semiconductors <ul style="list-style-type: none"> •Electron flow vs. Conventional flow •Semiconductors & solid state •Silicon vs. Germanium •Doping •P & N material •Majority carriers / Minority carriers 	PN Diode <ul style="list-style-type: none"> • Construction of a PN Diode • Depletion layers • Biasing – Forward and reverse • Characteristics curve & symbol • Calculation of Diode Load Line Zener Diode <ul style="list-style-type: none"> • Construction • Principle of operation • Forward Biasing • Reverse Biasing • Avalanche breakthrough vs. controlled breakthrough • Zener as a voltage regulator • Characteristics curve & symbol • Zener calculations Practical: Determine the value of the series resistor for a Zener diode	The NPN Transistor <ul style="list-style-type: none"> • Construction • Principle of operation • Purpose of Biasing & Thermal Runaway • Forward Biasing • Reverse Biasing • Base Curve • Emitter Output curve • Regions of operations (saturation, active and off) • The transistor DC Load Line • Transistor power related to the load line (Vcc and Vce) • Influence of the DC Load Line on the characteristics of the transistor • Symbol 	Application of Transistors <ul style="list-style-type: none"> • Transistor as a switch • Transistor as an amplifier • Transistor gains • Current & Voltage gain Practical: Determine the DC Load line of the transistor Practical: Built a circuit using the transistor as a switch	The PNP Transistor <ul style="list-style-type: none"> • Construction • Principle of operation • Relation to NPN • Symbol • Application – simple circuits only Practical: Built a circuit using the transistor as a switch	Thyristor - SCR <ul style="list-style-type: none"> • Construction • Principle of operation • Purpose of Biasing • Symbol • Characteristics curve • Application (Relaxation Oscillator, Phase Control, Switch mode application, DC-DC Converter (buck/boost)) • Circuit diagram 	Practical: Construct a Relaxation Oscillator and show waveform on oscilloscope Practical: Construct a light dimmer circuit	TRIAC <ul style="list-style-type: none"> • Construction • Principle of operation • Purpose of Biasing • Symbol • Characteristics curve • Application (Relaxation Oscillator, Phase Control, Switch mode application, DC-DC Converter (buck/boost)) • Circuit diagram DIAC Construction <ul style="list-style-type: none"> • Principle of operation • Purpose of Biasing • Symbol • Characteristics curve • Application (Relaxation Oscillator, Phase Control, Switch mode application, DC-DC Converter (buck/boost)) • Circuit diagram application 		
	Resources (other than textbook) to enhance learning	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	
Informal 3ssess; remediation	Classwork / Case studies / Worksheets / Homework / Theory and Practical etc.)									
SBA (Formal Assessment)	PAT Simulation 2 completed Term Test he 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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TERM 3 (52 days)	1: 13-16 Jul (4)	2: 19-23 Jul (5)	3: 26-30 Jul (5)	4: 02-06 Aug (5)	5: 10-13 Aug (4)	6: 16-20 Aug (5)	7: 23-27 Aug (5)	8: 30 Aug- 3 Sept (5)	9: 06-10 Sept (5)	10-11: 13-23 Sept (9)
CAPS topic	Power Supplies	Power Supplies	Power Supplies	Power Supplies	Amplifiers	Amplifiers	PAT (project)Consolidation	PAT (project)Consolidation	Revision	Test
Concepts, skills and values	DC Power Supplies <ul style="list-style-type: none"> • Concept of transformation • Rectification (half wave and full wave) ➢ Waveforms ➢ Circuit construction (Practical) ➢ Representation of waves on Oscilloscope 	Filtering (Ripple Factor, C, LC) and waveforms <ul style="list-style-type: none"> • Block diagram • Circuit diagram and construction of a filter on breadboard • Representation of waves on Oscilloscope • Ripple factor 	Voltage Regulation (Series & shunt regulation using Zener Diode and transistor) <ul style="list-style-type: none"> • Circuit diagram • Waveforms • Measurement with multimeter • Zener calculations of the series resistor 	Practical: Connect a series regulator circuit on the breadboard Practical: Connect a shunt regulator circuit on the breadboard	Introduction to Amplifiers <ul style="list-style-type: none"> • Definition of an amplifier • Types of amplifiers (Class A, B, AB and C) using transistors • Principle of operation of a transistor amplifier • Connection • Characteristics • Circuit diagrams Input and output signals of: <ul style="list-style-type: none"> • Common Base (no biasing) • Common Collector (no biasing) • Common Emitter (with different types of biasing) 	Biasing of transistor amplifiers <ul style="list-style-type: none"> • Types of biasing applied to the Common Emitter amplifier ➢ Fixed Base Biasing <ul style="list-style-type: none"> • Simple circuit diagram • Advantages & disadvantages ➢ Collector feedback biasing <ul style="list-style-type: none"> • Basic circuit diagram • Advantages & disadvantages 				
Resources (other than textbook) to enhance learning	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources				
Informal assessm; remediation	Classwork / Case studies / Worksheets / Homework / Theory and Practical etc.)									
SBA (Formal Assessment)	<p style="text-align: center;">Term Test PAT Simulation 3 completed</p> <p>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,</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. 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.</p>									

National Revised ATP: Term 4 Grade 11 Electrical Technology: Electronics 2021

TERM 4 (47 days)	1: 05-08 Oct (4)	2: 11-15 Oct (5)	3: 18-22 Oct (5)	4: 25-29 Oct (5)	5: 01-05 Nov (5)	6: 08-12 November (5)	7: 15-19 Nov (5)	8: 22-26 Nov (5)	9: 29 Nov – 3 Dec (5)	10- 06-08 Dec (3)
CAPS topic	Amplifiers	Amplifiers	Amplifiers	Sensors and transducers	Sensors and transducers	Communication Systems	Consolidation and Revision	PATmoderation	Exams	Exams
Concepts, skills and values	<ul style="list-style-type: none"> Voltage Divider Biasing ➤ Circuit diagram ➤ Function of components in the circuit ➤ Advantages & disadvantages Calculation of: • Transistor DC Load line (Common Emitter amplifier with fixed current biasing) • Reference to regions of operation as well as Vcc and Vce • The interpretation of a load line in conjunction with an AC signal (active region) to determine the values of the base and collector current, using emitter output curve to derive amplification classes. <p>Influence of DC biasing on the load line and Q point</p>	<p>Feedback in Amplifiers</p> <ul style="list-style-type: none"> • What is feedback? (Applications & purpose) • Negative feedback (Basic Introduction only – block diagram) ➤ Advantages and disadvantages ➤ Reasons for using negative feedback ➤ Applications of negative feedback • Positive feedback ➤ Advantages and disadvantages ➤ Reasons for using positive feedback ➤ Applications of negative feedback 	<p>The Common Emitter Amplifier</p> <ul style="list-style-type: none"> • Input waveform • Output waveform • Breadboard construction • Representation of waves on Oscilloscope <p>Practical: Class A Audio amplifier (Construction, testing & measurements)</p>	<p>Introduction to Sensors and Transducers</p> <ul style="list-style-type: none"> • Definition of sensors and transducers • Piezo Electric Effect • Wheatstone bridge principles of resistance measurement 	<p>Functional operation of Sensors and Transducers:</p> <ul style="list-style-type: none"> • Sound ➤ Dynamic Microphone ➤ Electret Microphone • Light ➤ The LDR ➤ Photodiode ➤ Phototransistor ➤ Opto-coupler • Temperature ➤ The Thermistor ➤ Thermocouple – Working principle and special conditions for use. (Not a linear resistive output – to be used with lookup table) 	<p>Transmitters and Receivers</p> <ul style="list-style-type: none"> • Basic principle of operation • What is modulation? • Waveforms • Block diagrams • Principle of operation • Types of modulation & related devices ➤ Continuous Wave modulation (CW) ➤ CW (Morse Code) Transmitter ➤ Regenerative Receiver ➤ Amplitude Modulation (AM) ➤ The AM Transmitter ➤ The AM Receiver 				
Resources (other than textbook) to enhance learning	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources	Educational videos and IT related resources			
Informal assessm; remediation	Classwork / Case studies / Worksheets / Homework / Theory and Practical etc.)									
SBA (Formal Assessment)	Examination									