ECVET – Curriculum

UNIT TEMPLATE

Institution:	MCAST
Programme/Training Title:	Advanced Diploma in Electrical studies
Unit Title:	Electrical Technology 1
Unit Type (e.g. major, minor, elective):	Major
Unit Level:	EQF Level 4
Duration:	15 weeks
Pre-requisites:	EQF Level 3 qualification
Instructor:	Marjohn Demanuele
Number of ECVET credits:	6

Learning Outcomes

By completion of this unit the learner should be able to

1. Identify the behavior of simple DC circuits and perform basic calculations on series, parallel and series-parallel DC circuits applying the correct units.
2. Outline the principles of static electricity and apply them in electrical devices such as capacitors.
3. Examine the principles of magnetic properties as applied to permanent magnets and coils and how these properties are used to develop motor and generator principles.
4. Identifies the effects of applying AC voltage to series circuits including passive electrical components by carrying out calculations including the use of phasor diagrams.

UNIT 3 Electrical Technology 1				
Learning outcomes By the end of this course a learner is expected to:	**Method of Assessment**	**ECVET System**		**Estimated student work time in hours**
1. Identify the behavior of simple DC circuits and perform basic calculations on series, parallel and series-parallel DC circuits applying the correct units.	• Home based assignments • Oral examination • Time constrained assignments (TCA). Class exams • Lab work/experiments	K	1. Understand the use of SI units and the system of multipliers and dividers. 2. Understand the atomic structure and production of electricity. 3. Understand the factors affecting resistance. 4. Understand Ohm's law and its use in simple DC circuits. 5. Understand the principles of electric power and energy. 6. Understand the effects of internal resistance in power sources like cells. 7. Transfer the knowledge of theory to simple real life engineering situations.	40
		S	1. Calculate resistance values both as a single unit and when in combination in circuits. 2. Solve simple DC circuits. 3. Apply rules governing power, to circuits and calculate simple	

			problems involving energy cost. 4. Calculate the effects of voltage drop in cables. 5. Solve problems arising from the combination of cells connected in series and parallel. 6. Explain circuit diagrams including relevant symbols and standards 7. Draw block diagrams symbolizing systems. 8. Represent waveforms using phasor diagrams. 9. Select the appropriate method to solve problems related to DC circuit solutions	
		C	1. Understand the operation of simple DC electrical circuits using different resistor and power values.	
2. Outline the principles of static electricity and apply them in electrical devices such as capacitors.	• Home based assignments • Oral examination • Time constrained assignments (TCA). Class exams • Lab work/experiments	K	1. Understand the concepts and properties of Electrostatics. 2. Understand the properties of charge and capacitance as applied to capacitors. 3. Recognise different types of capacitors. 4. Understand the effects of capacitors connected in different combinations in a simple circuit.	26
		S	1. Calculate different values of quantities pertaining to charge, voltage, capacitance	

			and dielectric. 2. Define different types of capacitors and their applications. 3. Solve problems of capacitor values and effect when connected in series, parallel and series-parallel combinations. 4. Draw graphs 5. Illustrate simple engineering drawings 6. Apply different techniques to calculate various quantities related to capacitor circuits	
		C	1. Understand the principles of capacitors and their use in electrical applications.	
3. Examine the principles of magnetic properties as applied to permanent magnets and coils and how these properties are used to develop motor and generator principles.	• Home based assignments • Oral examination • Time constrained assignments (TCA). Class exams • Lab work/experiments	K	1. Understand the basic concepts and properties of Electromagnetics. 2. Understand properties of permanent magnets and electromagnets. 3. Understand the properties pertaining to magnetic circuits. 4. Recognise the principle of operation of motors and generators. 5. Identify the properties and effects of self- and mutual-inductance.	42
		S	1. Apply the principles of magnets, electromagnets and magnetic circuits to calculate quantities used in the design of different electrical equipment. 2. Demonstrate the principle of operation of an electric motor and generator and solve simple related calculations.	

			3. Calculate values of self- and mutual-inductance as applied to different situations in electrical engineering. 4. Explain results and outcomes in a clear and concise format. 5. Select different simple machine drawings and recognise the different functions performed.	
		C	1. Understand the principles of inductors and their use in electrical applications.	
4. Identifies the effects of applying AC voltage to series circuits including passive electrical components by carrying out calculations including the use of phasor diagrams.	• Home based assignments • Oral examination • Time constrained assignments (TCA). Class exams • Lab work/experiments	K	1. Understand the different properties of a sinewave. 2. Recognise the effects of AC voltage and current as applied to resistive, inductive and capacitive loads. 3. Recognise the effects of AC voltage and current as applied to a combination of RL&C loads connected in series 4. Recognise the differences of power in AC series circuits.	42
		S	1. Apply the principles of AC supply to L-R, C-R and R-L-C series circuits. 2. Demonstrate the effects of resonance in a series AC circuit. 3. Apply properties of AC power in ac circuits. 4. Represent waveforms using phasor diagrams 5. Consider basic theoretical principles to solve more complex. 6. Gain adequate knowledge to continue	

			studying into further advanced modules. 7. Simplify complex tasks into smaller simple tasks.	
		C	1. Explain the function and properties of series AC circuits.	
			TOTAL	**150**

Unit Outline:

LO1
SI unit system including primary & secondary units and prefixes and multipliers.
The atom and its structure.
Ions, charge, and generation of voltage by separation of charge, emf and potential difference.
Current as a flow of charge (Q=It).
Factors affecting resistance.
Specific resistance or resistivity, and temperature coefficient of resistance.
Understanding types of resistors linear/non-linear (PTC, NTC, VDR, LDR).
Ohm's law.
Addition of series, parallel and series/parallel resistances.
Potential and current divider rule.
Power and energy (including kWh).
Voltage drop and power loss and insulation resistance in cables.
Heating and machine efficiencies.
Primary and secondary cells.
Internal resistance and terminal voltage of electrical sources.
Cells connected in series, parallel and series/parallel.

LO2

Electrostatics, charge and electric flux. Electric field, electric flux density and permittivity. Electric field strength, electric flux density. Capacitance using examples of parallel plate and multi-plate capacitors. Energy stored in a capacitor. Transient characteristics of capacitors when charging and discharging Types of capacitors and properties of capacitors to include charging and discharging. Series, parallel and series/parallel combinations of capacitors.
LO3 Permanent magnets; Theory of magnetic-domains and dipoles. Methods of producing and storing magnets; demagnetisation Magnetic fields. Magnetic flux, flux density Forces of attraction and repulsion in magnetic fields. Magnetic fields due to a current carrying conductor. Magnetic field of a solenoid. Magneto motive force mmf. Magnetising force H, Permeability, μ. B-H curve. Force on a current carrying conductor. Principle of a DC motor. Emf generated by a conductor moving within a magnetic field. Principle of a generator. Flemings left and right hand rules; Faraday's and Lenz's laws. Back emf. Self and mutual induction. Energy stored in a coil.
LO4 Uni-directional and alternating wave forms: Identification of a sine wave:

- o Peak
- o Peak to peak
- o Cycle
- o Period
- o Frequency
- o Average, rms and form factor

Phase shift in sinusoidal waveforms
Simple introduction to phasors.
Combination phasor diagrams.
Relationships of current and voltage relating to pure resistor, pure inductor and pure capacitor.
Relationships of current and voltage in L-R, C-R and R-L-C series AC circuits.
R, XL, XC, and Z in AC circuits.
Resonant frequency and Q-factor.
Power and power factor in AC circuits using the formula $P=IV\cos\varphi$.
The power triangle and its components.

Teaching / Facilitating methods

Classroom equipped with whiteboard, projector and links to internet. In addition an electrical/electronics laboratory equipped with basic items like power supply, signal generator and oscilloscope. In addition basic electronics equipment like variable resistor values, breadboard multi-meter and basic hand tools.

Assessment methods

- Home based assignments
- Oral examination
- Time constrained assignments (TCA). Class exams
- Lab work/experiments

Required books:

Authors	Title	Editor	Year	ISBN
John Bird	Electrical Circuit Theory and Technology	Newnes	2010	ISBN 0 7506 5784 7

Suggested books:

Authors	Title	Editor	Year	ISBN
Hughes	Electrical and Electronic Technology, Ninth Edition	Pearson Education, Harlow.	2005	ISBN: 978-0-13-206011-0
Kuphaldt T	2003 - 201 2); All About Circuits; Free Access Online Text Books			
Websites	http://www.allaboutcircuits.com/ Volume I – DC Volume II - AC			

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