HLUVUKANIe LABs

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING TRAINING (DEEET)

SCHOOL OF SOLAR ENERGY

STUDY GUIDE FOR

QUALIFICATION: Certicate of
Solar Electrical Energy Competency 1

COURSE CODE: SEEc01
COURSE DURATION: One Week
COURSE CREDITS: 3

COMPILED BY: N.E Mabunda

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Dr. N.E Mabunda

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1. INTRODUCTION

Welcome to the Short Learning Programme (SLP) for Solar Electrical Energy Competency level 1. This programme will introduce you to the fundamentals of solar electrical energy technology. So far, electrical technologists and electrical engineers are worried about the production and distributions of alternating current (ac) that is converted to lower voltage direct current (DC) when a need arise. This offering seeks to explore the opposite, where innovative strategies to support the production of low voltage DC electricity from photovoltaic systems (PV) will be developed; when any need arise, this voltage will be raised to high voltage ac. In this programme, the students will be taught to sketch freehand schematic diagrams that will be translated to prototypes made on Veroboard or bread board. The programme also forms the foundation of Level 2 that will be offered on due course.

Some of the important milestones in evolution of electricity are

500 B.C. Thales of Miletus discovered static electricity by rubbing fur on amber.
1700 Franklin’s kite – English scientist Francis Hauksbee made a glass ball that glowed when rubbed while experimenting with electrical attraction and repulsion.
1882 A house in Appleton, Wisconsin became the first American home to be powered by hydroelectricity.
1890 - 1910 Knob and tube wiring was used for electric installation.
1920 -1940 Flexible armored cable, which offered some protection from wire damage, became common place.
1940 Electricians began using metal conduit, in which several insulated wires were enclosed in rigid metal tubes.
1965 Grounded wires, which direct stray electrical current back into the ground, created a safer environment for homeowners.

In this 20th century, Engineering scientist and technologists are now concerned with environmental friendliness of electrical production systems. This has led to more research towards the use of renewable energy sources such as wind and solar.

2. GENERAL INFORMATION

The certificate will be awarded to those who have obtained a minimum mark of 50% for theory tests, 60 percent for practical assessments, 70 percent for projects, and a minimum average of 60%. Candidates may not proceed to the next phase of assessment until they have obtained a minimum mark of 40 percent for every presiding assessment.

The final mark consists of two theory tests, three practical assessment and five projects. Eighty percent attendance is compulsory, failing that will mean a retake of this course during its repeating cycle.

Should any circumstance prohibit a candidate to attend the class, the instructor should be informed via **WhatsApp or physical call.**

Your instructor is Dr. Nkateko E Mabunda, Cellphone no: +2784 503 5868, available at the hosting venue during the periods of this offering.

3. PROGRAMMEME DEFINITION

SLP NAME	:	Solar Electrical Energy Competency 1
CODE	:	SEEc01
NQF LEVEL	:	5
MODULE PRE-REQUISITE	:	GRADE 12 MATHEMATICS AND SCIENCE
MODULE DURATION	:	25 NOTIONAL HOURS
MODULE RANGE	:	This programme is limited to the fundamental principles of solar electrical technology.
PRE-KNOWLEDGE:	:	The learner must have mastered the following: Principles of electricity, power, energy, and linear algebra.
TEACHING AND LEARNING STRATEGIES	:	The programme will be presented as a set of lectures integrated with practical and projects. The emphasis will be on personal problem solving, creative thinking and innovative solutions. The candidates will be stimulated to work independently and in groups

Books : Notes, fundamentals of electronics by EE Glasspool,
J. Bird, Electrical Circuit Theory and Technology and Routledge
and C.K. Alexander and M.N.O. Sadiku, Fundamentals of Electric Circuits.

4. GENERIC ENGINEERING STANDARDS

The following standards will be used in the assessment of this module:

- Proven Engineering philosophies, principles, processes, procedures and practices
- Industrial norms and standards and manufacturer specifications
- SABS Quality standards and parameters
- Occupational Health and Safety Act
- Quality assurance norms as established by HEQC and internal university assurance policies
- Quality assurance norms as established by The Engineering Council of South Africa (ECSA)

Please adhere to all covid-19 regulations

5. UNITS OF LEARNING

Unit (duration)	Syllabus	Reference
Definitions of basic electricity terms (3 hours)	On completion of this chapter, student will be able to: ▪ Define the terms Charge, Current, Voltage, Resistance, Power and Energy ▪ discuss the significance and properties of: Current, Voltage, Resistance, Power and Energy. ▪ give a contrast between conductors and Insulators. ▪ name the Instruments used in the field of electricity. ▪ and be familiar with common electrical engineering measurement tools.	Notes
Electrical Circuits Configurations (6 hours)	On completion of this chapter, student will be able to: ▪ describe basic electronics and electrical components, ▪ identify or present basic electrical and electronics component symbols, ▪ design and sketch a circuit diagram to present parallel or series connected electronics or electrical components, ▪ interpret basic electrical or electronics schematics and ▪ transfer schematic diagrams to working physical circuits and reverse engineering.	Notes
DC energy sources and electronic signal measurements (6 hours)	On completion of this chapter, student will be able to: ▪ understand the principles of converting ac voltage to DC voltage and reduction of DC, ▪ describe battery storage systems, ▪ understand the technology / science of solar electricity production and system designs, ▪ and evaluate various types of energy saving schemes	Notes and EE Glasspoole

ac energy sources, circuits properties and signal analysis (6 hours)	On completion of this chapter, student will understand: ▪ production of ac voltage by inverters, ▪ stepping up or stepping down of ac voltage, ▪ harmonics, ▪ RLC reactance, ▪ and power factor and power factor correction.	Notes, J. Bird, Electrical Circuit Theory and Technology, Routledge And C.K. Alexander and M.N.O. Sadiku, Fundamentals of Electric Circuits
Energy conversions (4 hours)	On completion of this chapter, student will be able to: ▪ describe types of energy conversions, ▪ use efficiency to transfer energy quantity from one format to the other, ▪ and describe the techniques of energy saving and their impact	Notes.

6. ASSESMENT DETAILS

TESTS WEIGHTING It is essential to obtain an average of 50%

Test 1 **10%** **Date:** ________________________________
Test 2 **10%** **Date:** ________________________________

PRACTICAL WORK It is essential to obtain an average of 60%

Practical Tests 1 **10%** **Date:** ________________________________
Practical Tests 2 **10%** **Date:** ________________________________
Practical Tests 3 **10%** **Date:** ________________________________

Project It is essential to obtain an average of 70%

Project 1 **10%** **Date:** ________________________________
Project 2 **10%** **Date:** ________________________________
Project 3 **10%** **Date:** ________________________________
Project 4 **10%** **Date:** ________________________________
Project 5 **10%** **Date:** ________________________________

Total Mark **100%** It is essential to obtain an average of 60%

7. RUBRICS

SCHOOL OF SOLAR ENERGY

Solar Electrical Energy Competency 1

TECHNICAL PROJECT

EVALUATOR:	
STUDENT ID NUMBER:	
STUDENT NAME:	
PROJEC TITLE	

		COMMENTS	
LEVEL	**/30**		
Has basics of electronics been applied?			
Has additional technical knowledge been applied?			
WAS THE BEST SULUTION CHOSEN	**/30**		
Was an effort made to evaluate several?			
alternatives? Was the best solution for the project			
finally chosen?			
QUALITY, EFFICIENCY, COST EFFECTIVENESS	**/40**		
Does the hardware comply with ergonomic, health and safety norms and ECSA standards?			
Has project maintenance been considered?			
Has the project been designed in a modular format?			
What is the quality of the workmanship?			
TOTAL			
FUNCTIONALITY FACTOR (0-1)			
FINAL= TOTAL X FUNCTIONALITY FACTOR	**/100**		