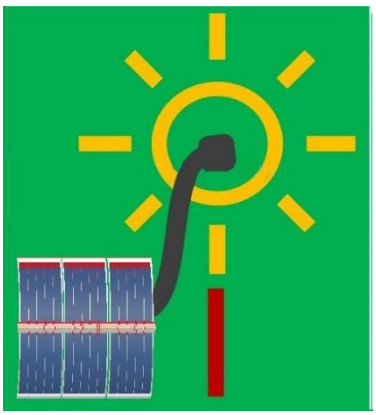

HLUVUKANIe LABs

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING TRAINING (DEEET)

SCHOOL OF SOLAR ENERGY

STUDY GUIDE FOR

QUALIFICATION: Certificate of
Electronics Security Systems Competency 2

COURSE CODE: SESc01
COURSE DURATION: One Week
COURSE CREDITS: 3

COMPILED BY: N.E Mabunda

2022

Latest Revision: September 2022
Dr. N.E Mabunda

TABLE OF CONTENTS

1. INTRODUCTION

A transducer will translate energy from one form onto the other form. In the context of electronics, a transducer will produce electrical signals when subjected to various forms of energy e.g. kinetic, chemical, vibrations, temperature, etc. On the other hand, actuator will use electric signals to produce other kinetic energy, e.g. vibrations, audio, and many other forms of movement. These concepts have made possible the establishment of sensors and indicators. Sensors are used to detect signals, they are found in cameras, security devices, automobiles and many more. As mentioned, actuators translate electrical signals to a form which may be recognized by users, examples include: audio, visual indicators, vibrations, etc. Signals that are collected by sensors have to undergo some form of processing, depending on the application; signals may be conditioned and magnified or reduced. Signal processing is a broader topic on its own, we will therefore not dwell too much in it in this course.

Some examples of sensors and transducers

5 Light bulb converts electrical current to light

6 Microphone converts sound energy to electrical current variations

7 Electrical relay uses electrical current to move its contact plates

8 And electric motor translates an incoming current into rotational energy

9 screw jack converts rotational energy into linear motion

Sensors and actuators benefit electronic systems applications such detection of intruders or hazards to activate indicators, sirens, gates, etc.

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	:	SESC01
NQF LEVEL	:	5
MODULE PRE-REQUISITE	:	Electronics Security Systems Competency 2
MODULE DURATION	:	25 NOTIONAL HOURS
MODULE RANGE	:	Transducers, Basic Audio and Video principles, Radio technology, amplifiers, and security equipment
PRE-KNOWLEDGE:	:	The learner must have mastered the following: Basic analog or digital electronics and knowledge of microcontrollers will be beneficial.
TEACHING AND LEARNING STRATEGIES	:	The program 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
and Principles of Electronic Communication systems Third Edition Louis E. Frenzel Jr.

.

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
1) Transducers., actuators and detectors	On completion of this chapter, student will be able to: ▪ Describe with the aid of diagrams, the operation of speakers and microphones. ▪ describe with the aid of diagrams, the operation of a relay. ▪ convert ammeters to voltmeters or ammeters to voltmeters and ▪ describe various types of displays.	Notes
2) Amplifiers and Audio /Video systems	On completion of this chapter, student will be able to: ▪ design and analyze basic op amp circuit, ▪ describe a composite video signal, ▪ Identify various audio video cables and conectors	(Textbooks and online sources)
3) Electrical signal transmission and Radio Frequency principles	On completion of this chapter, student will be able to: ▪ Explain the basic production of amplitude modulation, mixing, and frequency conversion by a diode or other nonlinear frequency component or circuit . ▪ Describe the operation of diode modulator circuits and diode detector circuits. ▪ Describe frequency modulation Identify the function of each component of a superheterodyne receiver. ▪ Express the relationship between the IF, local oscillator, and signal frequencies mathematically and calculate any one of them, given the other two.	Principles of Electronic Communication systems Third Edition Louis E. Frenzel Jr.
	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.	
4) Intercoms, alarms, and access control)	On completion of this chapter, student will be able to: ▪ Describe operational principle for various intercoms, their implementation, and unique applications. ▪ Give examples of access control as used for security service and describe the operation of Radio Frequency Identification. ▪ Give an overview of alarm systems, design and construct an Arduino Uno version of a siren connected alarm system	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**		