

Domain

**ELECTRONICS**

Title: **Apply knowledge of sequential digital electronic circuits**

Level: 3

Credits: 10

**Purpose**

This unit standard specifies the competencies required to apply knowledge of sequential digital electronic circuits. It include demonstrating knowledge of sequential digital electronic components and circuits, sketching sequential digital electronic circuit diagrams, analysing sequential digital electronic circuits, simulating sequential digital electronic circuits and measure parameters in sequential digital electronic circuits. This unit standard is intended for those who work electronics industry.

**Special Notes**

## 1. Entry information

## Prerequisite

- *Unit E01 - Apply health and safety rules and regulations in electronics workplace*
- *Unit E02 - Plan and organise work in electronic work environment*
- *Unit E09 - Apply knowledge of combinational digital electronic circuits*

## 2. Assessment evidence may be collected from a real or a simulated workplace in which electronics operations are carried out.

## 2. To demonstrate competence, minimum evidence of knowledge of sequential digital electronic components, sketching of sequential digital electronic circuit diagrams, analysis of sequential digital electronic circuits, simulation of sequential digital electronic circuits and measurement of parameters in sequential digital electronic circuits (at least 50 percent of all areas in the element) is required.

## 3. All circuit analyses methods include calculations, measurements and simulations

## 4. Glossary of terms:

- IEC 60617 - **International Electro-technical Commission** and this standard for electrical components symbols.
- IEEE- Institute of Electrical and Electronics Engineers.

## 5. Regulations and legislation relevant to this unit standard include the following:

- Labour Act, No. 11, 2007.
- Occupational Health and Safety Regulations No. 18, 1997 and all subsequent amendments.

## 6. Performance of all elements in this unit standard must comply with industry standards.

## **Quality Assurance Requirements**

This unit standard and others within this subfield may be awarded by institutions which meet the accreditation requirements set by the Namibia Qualifications Authority and the Namibia Training Authority and which comply with the national assessment and moderation requirements. Details of specific accreditation requirements and the national assessment arrangements are available from the Namibia Qualifications Authority and the Namibia Training Authority on [www.nta.com.na](http://www.nta.com.na).

## **Elements and Performance Criteria**

### **Element 1: Demonstrate knowledge of sequential digital electronic components and circuits**

#### **Range**

Sequential digital electronic circuits include but not limited to latches, flip-flops, counters, 555 timers, shift registers and memory devices.

Digital electronics components include counters, 555 timers, flip-flops, shift registers.

Types of memory devices include RAM, ROM, EEPROM, and Flash.

#### **Performance Criteria**

- 1.1 Sequential digital electronic circuits are identified by their standard symbols, truth tables and/or inspection.
- 1.2 Pin layout for sequential logic ICs is determined from datasheets and by inspection.
- 1.3 Operation of sequential logic ICs is determined by measurement, truth table and/or datasheets.
- 1.4 Analogue to Digital and Digital-to-Analogue converters is described.
- 1.5 Different types of memory devices described.
- 1.6 Digital electronics components are analysed as per job requirements.

### **Element 2: Sketch sequential digital electronic circuit diagrams**

#### **Range**

Sequential digital electronic circuits include latches, flip-flops, counters, 555 timers, shift registers and memory devices.

#### **Performance Criteria**

- 2.1 Sequential digital electronic symbols used in circuit diagrams are in accordance with the IEC/IEEE standards.
- 2.2 Digital electronic components are connected to represent a given sequential digital electronic circuit.

2.3 Sequential digital electronic circuits are labelled and captioned in circuit diagrams.

### **Element 3: Analyse sequential digital electronic circuits**

#### **Range**

Sequential digital electronic circuits include latches (D, S-R), flip-flops (D, J-K, T), counters (up counters, down counters and up-down counters), 555 timers and shift registers (SISO, SIPO, PISO, PIPO).

#### **Performance Criteria**

- 3.1 Operation of latches and flip-flops are presented using truth tables and timing waveforms.
- 3.2 Counter circuits are analysed to determine count sequence.
- 3.3 Shift register circuits are analysed to determine output sequence.

### **Element 4: Simulate sequential digital electronic circuits**

#### **Range**

Sequential digital electronic circuits include latches, flip-flops, counters, 555 timers, shift registers and memory devices.

#### **Performance Criteria**

- 4.1 Sequential digital electronic circuits are captured in simulation software.
- 4.2 Virtual instruments are used for measuring voltage levels and wave forms.
- 4.3 Simulation results are recorded with appropriate SI units and interpreted.
- 4.4 Further calculations are performed based on the recorded results.

### **Element 5: Measure parameters in sequential digital electronic circuits**

#### **Range**

Waveform parameters to be measured include voltage levels, period, frequency and duty cycle.

#### **Performance Criteria**

- 5.1 Appropriate instruments are selected and used to measure parameters.
- 5.2 Electrostatic sensitive devices are handled in accordance with manufacturer`s manual.
- 5.3 Sequential digital electronic circuits are built on breadboard.
- 5.4 Waveform parameters are measured.
- 5.5 Different waveforms and logic outputs are recorded and interpreted.

### **Registration Data**

<b>Subfield:</b>	Electrical Engineering
<b>Date first registered:</b>	

<b>Date this version registered:</b>	
<b>Anticipated review:</b>	
<b>Body responsible for review:</b>	Namibia Training Authority

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