10.1.0 BASIC ELECTRONICS

10.1.1 Introduction

This module unit is intended to equip the trainee with relevant knowledge, skills and attitudes in basic elements of electronics to facilitate his/her understanding of digital system.

10.1.2 General Objectives

a) show understanding of simple a.c and d.c circuits
b) recognise various electronic components
c) show understanding of basic principles of semi-conductors
d) distinguish types of memories
e) show understanding of number systems
f) show understanding of the use of codes
g) appreciate the use of logic gates and Boolean algebra

10.1.3 Modul e Unit Summary and Time Allocation

Code	Sub-module Unit	Content	Time (Hrs)		
			Theory	Practice	Total
10.1.01	Introduction to electrical circuits	• Basic electrical quantities and their units	6	2	8
10.1.02	Simple a.c. circuits	• Effects of passive elements on current and voltage in a.c. circuits	8	4	12
10.1.03	Simple d.c. circuits	• Simple d.c. circuit • Resistivity of metal conductors	9	4	13
10.1.04	Electronic components	• Electronic components • Explanation of characteristics of electronic components • Statement of application of various components	9	4	13
10.1.05	Semiconductor theory	• Structure of matter. • Movement of electrons in conductors and	12	4	16

Code	Sub-module Unit	Content	Time (Hrs)		
			Theory	Practice	Total
		semiconductors. • Semiconductor materials • Formation of P and N-type materials • Operation of PNP and NPN transistors			
10.1.06	Memories	• Definition of terminologies • Classification of memories	10	4	14
		• Semiconductor memories • Magnetic memories • Optical storage			
10.1.07	Number systems	• Number systems • Base conversions • Binary arithmetic operations	11	11	22
10.1.08	Binary Codes	• Importance of binary codes • Binary codes • BCD arithmetic	10	10	20
10.1.09	Logic Gates and Boolean Algebra	• Definition • Minimisation of logic expressions	10	11	21
10.1.10	Emerging Trends in Electronics	• Emerging • Challenges • Coping	4	0	4
		Total	**89**	**54**	**143**

10.1.01 INTRODUCTION TO ELECTRICAL CIRCUITS

Theory

10.1.01T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to explain the basic electrical quantities and their units

10.1.01C Competence
The trainee should have the ability to identify simple electrical circuit and their quantities

Content

10.1.01T1 Basic electrical quantities and their units
- E.M.F in volts
- current in Amperes
- resistance in ohms
- power in watts
- energy in joules
- e.m.f in volts

Practice

10.1.01P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to identify simple electrical circuits and their quantities

Content

10.1.01P1 Basic electrical quantities and their units
- e.m.f in volts
- current in Amperes
- resistance in ohms
- power in watts
- energy in joules

Suggested Teaching/Learning Activities
- Demonstration
- Interactive lecture

Suggested Teaching/Learning Resources
- circuit diagrams
- relevant textbooks

Suggested Evaluation Methods
- Assignments
- Written tests

10.1.02 SIMPLE A.C CIRCUITS

Theory

10.1.02T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) explain terminologies used in a.c circuits
b) explain the effects of passive elements on current and voltage in a.c circuits
c) explain series and parallel connections

10.1.02C Competence
The trainee should have the ability to:
i) Verify effects of passive elements on voltage and current

ii) Solve tasks related to series and parallel circuits
iii) draw and interpret simple A.C. circuits

Content

10.1.02T1 Terminologies used in A.C circuits.
i) cycle
ii) periodic time
iii) frequency
iv) peak and average values

10.1.02T1 Effects of passive elements on current and voltage in A.C circuits
i) resistance
ii) inductance
iii) capacitance
iv) waveforms and phasor diagrams

10.1.02T1 Series and parallel circuits

Practice

10.1.02P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) verify effects of passive elements on voltage and current
b) solve tasks related to series and parallel circuits
c) draw and interpret simple a.c circuits

Content

10.1.02P1 Effects of passive elements on voltage and current
10.1.02P2 Tasks related to series and parallel circuits
10.1.02P3 Simple a.c circuit diagrams

Suggested Teaching/Learning Activities
- Demonstration
- interactive lecture

Suggested Teaching/Learning Resources
- Textbooks
- Inductors
- Capacitors
- Resistors
- AC Source of power
- Connecting wires

Suggested Evaluation Methods
- Assignments
- Written tests

10.1.03 SIMPLE D.C. CIRCUITS

Theory

10.1.03T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) explain the basic operations of simple d.c. circuits
b) explain resistivity of different metal conductors

10.1.03C Competence
The trainee should have the ability to demonstrate simple derived draw and interpret simple d.c. circuit

Content

10.1.03T1 D.C. circuit

i) d.c circuit diagram
ii) resistors in series
iii) resistors in parallel
iv) serial-parallel connection

10.1.03T2 Resistivity of metal conductors
i) length
ii) cross-section area
iii) conductivity

Practice

10.1.03P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) draw and interpret simple d.c circuit
b) Setup a simple dc circuit

Content
10.1.03P1 D.C circuit diagrams
10.1.03P2 D.C circuits

Suggested Teaching/Learning Activities
- Demonstration
- interactive lecture
- discussion

Suggested Teaching/Learning Resources
- dry cells
- wires
- metal condors
- resistors

Suggested Evaluation Methods
- Assignments
- Written tests

10.1.04.1 ELECTRONIC COMPONENTS

Theory

10.1.04T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) describe various electronic components
b) explain characteristics of various electronic components
c) state the application of various electronic components
d) explain characteristics of integrated circuits

10.1.04C Competence
The trainee should have the ability to identify an electronic component

Content
10.1.04T1 Electronic components
i) resistor
ii) capacitor
iii) diode
iv) inductor
10.1.04T2 Characteristics of electronic components
10.1.04T3 Application of electronic components
10.1.04T4 Characteristics of integrated circuits

Practice

10.1.04P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to identify an electronic component

Content

10.1.04P1 Electronic components
i) resistor
ii) capacitor
iii) diode
iv) inductor

Suggested Teaching/Learning Activities
- Demonstration
- Interactive lecture
- Discussion

Suggested Teaching/Learning Resources
- Resistor
- Capacitor
- Diode
- Inductor

Suggested Evaluation Methods
- Assignments
- Written tests

10.1.05 SEMI-CONDUCTOR THEORY

Theory

10.1.05T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) describe the structure of matter
b) explain the movement of electrons in conductors and semiconductors
c) describe various semiconductor materials
d) explain the formation of p and n-type materials
e) describe the operations of P-N junction

10.1.05C Competence
The trainee should have the ability to:
i) draw the structure of an atom
ii) identify various semi-conductor materials
iii) Demonstrate forward and reverse biasing of P-N type junction diodes

Content

10.1.05T1 Atomic structure
10.1.05T2 Electrons in conductors and semiconductors
10.1.05T3 Semiconductor materials
i) silicon
ii) germanium
10.1.05T4 Formation of P and N-type materials
10.1.05T5 Operation of PNP and NPN transistors

Practice

10.1.05P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) draw the structure of an atom
b) identify various semiconductor materials
c) demonstrate forward and reverse biasing of P-N junction diodes

Content

10.1.05P1 Structure of an atom
10.1.05P2 Semiconductor materials
10.1.05P3 Forward and reverse biasing of junction diodes

Suggested Teaching/Learning Activities

- Demonstration
- Interactive lecture
- Discussion

Suggested Teaching/Learning Resources

- whiteboard
- Charts
- Diodes
- Transistors
- LEDs
- textbooks

Suggested Evaluation Methods

- Assignments
- Written tests

10.1.06 MEMORIES

Theory

10.1.06T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) define memory
b) describe classes of computer memories types

10.1.06C Competence
The trainee should have the ability to classify memories

Content

10.1.06T1 Definition of memory
10.1.06T2 Computer memories types
i) Semiconductor memories
- RAM
- ROM
- Flash memory

ii) Magnetic memories
- magnetic drum
- magnetic core
- magnetic tapes
- magnetic disks

iii) Optical storage
- magnetic optic memory
- holographic

Practice

10.1.06P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to classify memories

Content

10.1.06P1 Classification of memories

Suggested Teaching/Learning Activities

- Demonstration
- interactive lecture
- discussion

Suggested Teaching/Learning Resources
- Whiteboard
- Textbooks

Suggested Evaluation Methods
- Assignments
- Written tests

10.1.07 NUMBER SYSTEMS

Theory

10.1.07T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) explain number systems
b) explain number base conversions
c) explain binary arithmetic operations

10.1.07C Competence
The trainee should have the ability to:
i) Perform number base conversions
ii) Perform number arithmetic operations

Content
10.1.07T1 Number systems
i) decimal numbers
ii) binary numbers
iii) octal numbers
iv) hexadecimal numbers
10.1.07T2 Base conversion
10.1.07T3 Binary arithmetic
i) addition
ii) subtraction
iii) multiplication
iv) division

Practice

10.1.07P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) perform number base conversions
b) perform number arithmetic operations

Content
10.1.07P1 Number base conversions
10.1.07P2 Binary number arithmetic operations

Suggested Teaching/Learning Activities
- Demonstration
- interactive lecture
- discussion

Suggested Teaching/Learning Resources
- White board
- Textbooks

Suggested Evaluation Methods
- Assignments
- Written tests

10.1.08 BINARY CODES

Theory

10.1.08T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) explain binary codes
b) describe BCD arithmetic

10.1.08C Competence

The trainee should have the ability to:

i) Represent decimal numbers in BCD
ii) Perform BCD arithmetic

Content

10.1.08T2 Binary codes
- i) 8421 BCD
- ii) Excess-3
- iii) Importance of binary codes

10.1.08T3 BCD arithmetic
- i) addition
- ii) subtraction
- iii) multiplication
- iv) division

Practice

10.1.08P0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

a) representation of decimal numbers in BCD
b) perform BCD arithmetic

Content

10.1.08P1 Representation of decimal numbers in BCD

10.1.08P2 BCD arithmetic

Suggested Teaching/Learning Activities

- Demonstration
- interactive lecture
- discussion

Suggested Teaching/Learning Resources

- Whiteboard
- Textbooks

Suggested Evaluation Methods

- Assignments
- Written tests

10.1.09 LOGIC GATES AND BOOLEAN ALGEBRA

Theory

10.1.09T *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

a) explain logic gates
b) explain the minimisation of logic expressions

10.1.09C Competence

The trainee should have the ability to:

i) Generate truth tables
ii) Simplify logical expressions

Content

10.1.09T1 Logic gates (AND, OR, NOT, NAND, NOR)
- i) symbols
- ii) truth table

10.1.09T1 Minimisation of logic expressions
- i) Boolean algebra
- ii) KARNAUGH maps

Practice

10.1.09P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) generate truth tables of logic gates
b) simplify logical expressions

Content
10.1.09P1 Truth tables of logic gates
10.1.09P2 Logical expressions

Suggested Teaching/Learning Activities
- Demonstration
- Interactive lecture
- Discussion

Suggested Teaching/Learning Resources
- White board
- Textbooks
- Internet

Suggested Evaluation Methods
- Assignments
- Written tests

10.1.10 EMERGING TRENDS

Theory

10.1.10T *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) describe the emerging trends in basic electronics
b) explain the challenges of emerging trends in basic electronics
c) cope with emerging trends in basic electronics

10.1.10C Competence
The trainee should have the ability to cope with challenges of emerging trends in basic electronics

Content
10.1.10T1 Emerging trends
10.1.10T2 Challenges of emerging trends
10.1.10T3 Coping with emerging trends

Suggested Teaching/Learning Activities
- Interactive lecture
- Discussion

Suggested Teaching/Learning Resources
- Manuals
- Journals
- Internet

Suggested Evaluation Methods
- Case study
- Written tests