22.2.0 DATA COMMUNICATION

22.2.01 Introduction

This module is designed to equip the trainee with the necessary knowledge, skills and attitudes required to understand the principles of data communications. Trainees require prior knowledge of micro electronics to enhance their understanding of the content of this module.

22.2.02 General Objectives

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

a) understand the concepts of data communication
b) apply different transmission media in data communication
c) understand various coding schemes
d) apply various data transmission media
e) apply various digital modulations techniques
f) appreciate the need for international standards in data communication
g) appreciate the concept of open system interconnects on model

22.2.03 Module Summary and Time Allocation

Data Communication

Code	Unit	Sub Unit	Time Hrs		
			Th.	Pra.	Total
22.2.1	Communication Fundamentals	• Definition of terms • Definition between transmission • Basic data communication network • Transmission impairment	4	4	8
22.2.2	Signal Encoding and Modulation Techniques	• Encoding schemes • Digital to analog signal encoding • PCM • Multiplexing schemes	6	6	12
22.2.3	Switching Systems	• Principles of circuit switching • OSI model	2	6	8
22.2.4	Data Transmission Media	• Guided transmission media • Wireless transmission media • Standards media	4	8	12
22.2.5	Computer Networking	• Terminologies • LAN architecture • Medium access and control protocols	8	4	12
22.2.6	Mobile Phone	• Construction • Operation	6	8	14
Total Time			**30**	**36**	**66**

22.2.1 COMMUNICATION FUNDAMENTALS

Theory

22.2.1T0 *Specific objectives*
By the end of the sub module unit, the trainee should be able to:
a) define terms applied to data communication
b) distinguish between series and parallel transmission
c) describe the basics of a data communication network
d) explain types of transmission impairment

Competence
The trainee should have the ability to connect and repair transmission systems

Content

22.2.1T1 Definition of terms
i) Data
ii) Information
iii) Receiver
iv) Signal
v) Data Terminal Equipment (DTE)
vi) Data Circuit Terminating Equipment (DCTE)
vii) Simplex
viii) Half duplex
ix) Full duplex
x) Frequency
xi) Bandwitdth

22.2.1. T3 Distinction between transmission
i) Parallel
ii) Serial

22.2.1. T4 Basic data communication network
i) Point to point
ii) Multi point
iii) Distributed

22.2.1. T5 Transmission impairment
i) Noise
ii) Distortion
iii) Attention
iv) Sitters
v) Information theory concepts
vi) Information measurements
vii) Source coding
viii) Construction of optical codes
ix) Transmission rate
x) Channel capacity

Practice

22.2.1P0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:
a) Connect various transmission net work
b) Detect and rectify transmission impairment

Content

22.2.1P1 Transmission net work
- i) Simplex
- ii) Half duplex
- iii) Full duplex
- iv) Serial
- v) Parallel

22.2.1. P2 Transmission impairment

Suggested Teaching/ Learning
- i) Electrical and electronic measuring instruments
- ii) Data transmission equipment and devices
- iii) Switching circuits
- iv) Accessories

22.2.2 SIGNAL ENCODING AND MODULATION TECHNIQUES

Theory

22.2.2T0 *Specific objectives*
By the end of the unit, the trainee should be able to:
- a) explain digital to digital signal encoding schemes
- b) explain digital to analogue encoding schemes
- c) explain data multiplexing schemes

Competence
The trainee should have the ability to:
- i) Perform signal encoding
- ii) Connect multiplexing schemes

Content

22.2.2T1 Digital to digital signal encoding schemes
- i) Polar codes
- ii) Bipolar codes
- iii) Applications

22.2.2T2 Digital to analogue signal encoding scheme

22.2.2T3 Multiplexing schemes

Practice

22.2.2P0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:
- c) demonstrate digital to digital signal encoding
- d) demonstrate digital to analogue signal encoding
- e) connect multiplexing schemes

Content

22.2.2P1 Digital to digital encoding
- i) Polar codes
- ii) Bipolar codes

22.2.2P2 Digital to analogue signal encoding

22.2.2P3 Multiplexing schemes

Suggested Teaching/ Learning

i) Electrical and electronic measuring instruments
ii) Data transmission circuits

22.2.3 SWITCHING SYSTEMS

Theory

22.2.3T0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:
a) state the principles of circuit switching
b) explain the OSI model

Competence
The trainee should have the ability to connect switching

Content
22.2.3 T1 Principles of circuit switching
i) Digital data switching
ii) Digital PABX
iii) Broadband Integrated (BSDN)
iv) Service digital network
v) PSTN (Public Switching Telephone Network)
22.2.3 T2 Explanation of the OSI (Open System Interconnection) model
i) Layneation model
ii) Interconnection
iii) Physical (OSI layer)
iv) Data link
v) Network
vi) Transport
vii) Session
viii) Presentation
ix) Application

Practice

22.2.3P0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:
a) demonstrate circuit switching
b) illustrate OSI layers

Content
22.2.3P1 Circuit switching
i) Switching
ii) Digital data switching
iii) Digital PABX
iv) Broad basic integrated
v) In-service digital network
vi) Public Switched Telephone Network (PSTN)
22.2.3P2 Open system interconnection (OSI)
i) Physical
ii) Data link
iii) Network
iv) Transport
v) Session
vi) Presentation
vii) Application

Suggested Teaching/ Learning

i) Switching circuits
ii) Electrical and Electronic Measuring instruments

22.2. 4 DATA TRANSMISSION MEDIA

22.2.4T0 *Specific Objectives*

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

a) explain various types of guided transmission media
b) explain various types of wireless transmission media
c) state standards with respect to guided and unguided media

Competence

The trainee should have the ability to:

i) Perform signal encoding
ii) Connect multiplexing schemes

Content

22.2.4T1 Guided transmission media
i) Twisted pair media
ii) Coaxial cable
iii) Fibre optics

22.2.4T2 Wireless transmission media
i) Terrestrial microwave
ii) Satellite microwave
iii) Broadcast radio
iv) Infrared
v) switching systems

22.2.4T3 Standards for guided and unguided media

Practice

22.2.4P0 *Specific Objectives*

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

a) illustrate the various types of guided media
b) demonstrate various types of wireless transmission media

Content

22.2.4P1 Guided transmission media
i) Twisted pair wire
ii) Coaxial cable

22.2.4P2 Wireless transmission media
i) Terrestrial microwave
ii) Satellite microwave
iii) Broadcast radio
iv) Infrared

Suggested Teaching/ Learning

i) Electrical and electronic measuring instruments
ii) Data transmission circuits

22.2.5 COMPUTER NETWORKING

Theory

22.2.5T0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:
a) define various terminology applied to networking
b) describe LAN architecture and applications
c) explain media access control protocols

Content
22.2.5T1 Terminologies
i) LAN
ii) MAN
iii) WAN
22.2.5T2 LAN architecture
i) Applications
ii) Topologies
iii) Fast Ethernet
iv) Gigabit Ethernet
v) Token Ring
22.2.5T3 Explanation of medium access control protocols
i) Description of LAN devices
- Hubs
- Multi-station access units (MSAU)
- Repeaters
- Switches
- Bridges
ii) Virtual LANs
- Blue tooth architecture and layers

Practice

22.2.5P0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:
a) select correct apparatus/equipment and cable sizes for a given computer network task
b) safely wire computer network space
c) network computer in a LAN
d) maintain a LAN computer network

Content
22.2.5P1 Selection of material requirement
i) apparatus/equipment
ii) cable sizes
22.2.5P2 Space wiring
22.2.5P3 Computer networking operation
i) Proper layout
ii) Connections
iii) Software installation
22.2.5P4 Maintenance
i) Hardware
ii) Software

Suggested Learning Resources
i) Network cables and connectors

ii) Networking equipment eg hubs
iii) Computers
iv) Test instruments
v) Trunking trays and covers

22.2.6 MOBILE PHONE

Theory

22.2.6T0 *Specific Objectives*
By the end of this unit, the trainee should be able to:
a) draw the functional block diagram of a mobile phone
b) state function(s) of each block

Competence
The trainee should have the ability to:
i) Network computers (LAN)
ii) Maintain computer network

Competence
The trainee should have the ability to repair and service mobile phones

Content
22.2.6. T1 Block diagram
22.2.6. T2 Functions of each block

Practice

22.2.6. P0 *Specific Objectives*
By the end of the unit, the trainee should be able to:
a) identify parts of a mobile phone
b) diagnose faults in mobile phones
c) repair mobile phones

Content
22.2.6. T1 Parts of a mobile phone
i) Central processing unit (CPU)
ii) Power IC
iii) Antenna
iv) SIM card connector
v) Key board
vi) Power amplifier IC
vii) Radio frequency (RF) processor
viii) Directional coupler
ix) Memory IC
x) Charge control module
22.2.6. T2 Fault diagnoses
i) Use of fault diagnostic kits
ii) Computer applications
iii) Tests
22.2.6. T3 Repair of mobile phones
i) Fault analysis
ii) Fault repair
iii) Replacement of parts
iv) Soldering
v) Assembly

Suggesting Teaching and Learning Resources
i) Assorted mobile phones

ii) Test instruments
iii) Toolkit
iv) Catalogs
v) Circuit/schematic diagrams
vi) Internet