451 - COMPUTER STUDIES

GENERAL OBJECTIVES

By the end of the course, the learner should be able to:

1. appreciate computers and their components;
2. develop basic skills in the safe use and care of computers and their peripheral devices;
3. be acquainted with the fundamental concepts of computing;
4. appreciate the use of computers in different areas of application;
5. appreciate the impact of computer technology on society;
6. develop the skills to use application packages;
7. appreciate programming and acquire the knowledge to write and run simple programmes;
8. identify different educational and occupational opportunities available in the computing field;
9. acquire a firm base for further education, training and the world of work.

1.0.0 INTRODUCTION TO COMPUTERS

1.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a) state the different parts of a computer;
b) explain how computers have developed;
c) classify the various types of computers;
d) state the safety precautions and practices in a computer laboratory;
e) demonstrate basic hands-on-skills on the use of a computer.

1.2.0 Content

1.2.1 Definition of a computer
1.2.2 Parts of a computer
1.2.3 Development of computers
1.2.4 Classification of computers
- Physical Size
- Functionality
- Purpose

1.2.5 Areas where computers are used
1.2.6 Definition of a computer laboratory
1.2.7 Safety precautions and practices in a computer laboratory
- Behaviour
- Handling of materials and equipment
- Fire
- Cabling
- Stable power supply

- Burglar proofing
- Ventilation
- Lab layout
- Dust/damp control
- Lighting
- Standard furniture

1.2.8 Hands-on skills

- Start-up, restarting and shut-down (Booting)
- Keyboard layout
- Practical keyboard and mouse skills

2.0.0 COMPUTER SYSTEMS

2.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a) describe a computer system;
b) explain the functional organization of the elements of a computer system;
c) describe input devices of a computer system;
d) describe the central processing unit (CPU);
e) describe the output devices of a computer system;
f) describe the types of secondary storage devices and media;
g) distinguish between power and interface cables;
h) explain basic computer set-up and cabling;
i) distinguish between system software and application software;
j) evaluate the criteria for selecting a computer system.

2.2.0 Content

2.2.1 Description of a computer system

2.2.2 Functional organization of the elements of a computer system

- Hardware
- Software
- Live-ware

2.2.3 Input devices e.g.

- Keying devices
- Pointing devices
- Scanning devices
- Speech recognition devices
- Other digital devices

2.2.4 Central Processing Unit (CPU)

- Control Unit
- Arithmetic and Logic Unit (ALU)
- Memory
- Processors
  (i) types
  (ii) clock speeds

2.2.5 Output Devices

- Soft copy output devices e.g.

i) Visual display unit – Liquid Crystal Display (LCD), flat panel, cathode ray tube (CRT)
ii) Sound output
iii) Light emitting

- Hard copy output devices e.g.

i) printers (impact, non-impact)
ii) plotters

2.2.6 Secondary/Auxiliary Storage Devices and Media

- Fixed e.g. Hard disk
- Removable e.g.

i) floppy disks
ii) tape
iii) optical disks (CD-R, WORM, CD-RW, DVDs)
iv) zip disks

2.2.7 Power and Interface Cables

- Power cable
- Parallel cable
- Serial cable

2.2.8 Basic computer Set-up and Cabling

- Connecting basic computer components
- Connecting other computer peripherals

2.2.9 Classification of software

- Purpose
  a) System software
     i) firmware
     ii) networking software
     iii) operating system
     iv) utilities
  b) Application software
- Acquisition
  (i) standard software
  (ii) user developed (in-house)

2.2.10 Criteria for selecting a computer system (specifications)
Hardware considerations

- Processor speed
- Memory capacity
- Warranty
- Upgradability
- User needs
- Cost
- Portability
- Other considerations

Software considerations

- Authenticity
- User needs
- User friendliness
- System requirements
- Cost
- Compatibility
- Portability
- Documentation
- Other software considerations

3.0.0 OPERATING SYSTEMS

3.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a) define an operating system;
b) state the functions of an operating system;
c) describe types of operating systems;
d) describe how operating systems organize information;
e) manage files using an operating system;
f) manage disks using an operating system;
g) identify internal and peripheral devices under Operating System control.

3.2.0 Content

3.2.1 Definition of an operating system

3.2.2 Functions of an operating system

- Job scheduling
- Resource control
- Input/output handling
- Memory management
- Error handling
- Interrupt handling

3.2.3 Types of Operating Systems

- Number of users

i) single user
ii) multi user

- Number of tasks

i) single tasking
ii) multi tasking

- Interface

i) command line
ii) menu driven interface
iii) Graphical user interface (GUI)

3.2.4 Organization of Information using an operating system

- Files
- Directories/folders
- Storage media

3.2.5 File management using an operating system
- Description of files
- Types of files

i) system files
ii) application files
- Functions of files

i) storage of data
ii) organization of information
- Creating files
- Manipulating files
    i) viewing files and directories
    ii) organization of information
    iii) creating files/directories
    iv) opening
    v) editing
    vi) renaming
    vii) finding/searching
    viii) sorting
    ix) copying
    x) moving
    xi) deleting

3.2.6 Disk Management using an operating system
- Formatting
- Partitioning
- Defragmentation
- Disk diagnostics/Disk compression
- Back up

3.2.7 Devices under operating system control
- Processor
- Memory (Ram)
- Storage devices
- Input/output devices and ports
- Communication devices and ports

3.2.8 Installation and configuration of an operating system
- Trouble shooting

4.0.0 APPLICATION PACKAGES

4.1.0 Word processors
4.2.0 Spreadsheet
4.3.0 Database
4.4.0 Desktop publishing

4.5.0 Internet and E-Mail

4.1.0 WORD PROCESSORS

4.1.1 Specific Objectives

By the end of the topic, the learner should be able to:

a) define a word processor;
b) state the purpose of word processing;
c) use a word processing package;
d) format and edit a document;
e) create and edit a table;
f) create and update a mail-merge document;
g) print a document;
h) insert and edit objects.

4.1.2 Content

4.1.21 definition of a word-processor

4.1.22 Purpose of word processing e.g

- Letter preparation
- Reports
- Newsletters

4.1.23 Using a Word processing package

- Getting started
- Screen layout
- Running the program
    - i) Creating a document
    - ii) Saving
    - iii) Retrieving
    - iv) Closing
    - v) Exiting

4.1.24 Editing and formatting a document

- Editing a document
- Block options
    - i) Selecting
    - ii) Moving
    - iii) Copying
    - iv) Deleting
    - v) Inserting and type over
- Find and replace
    - i) Search/find
    - ii) Replace
- Proof-reading
    - i) Spelling and grammar checking
    - ii) Thesaurus
    - iii) Auto-correct
    - iv) Undo and redo

- Formatting a document

a) Text formatting
   i) Bolding
   ii) Italizing
   iii) Underlining
   iv) Fonts
   v) Drop caps
   vi) Change case
   vii) Superscript/subscript

b) Paragraph formatting
   i) alignment
   ii) indenting
   iii) spacing
   iv) section breaks
   v) bullets and numbering

c) Page formatting

- Layout
   i) columns
   ii) headers/footers
- Setup
   i) Margins
   ii) Orientations
   iii) Paper size
   iv) Tabs

4.1.25 Creating and Editing a Table

- Create a table
   i) Rows
   ii) Columns
- Enter data
- Editing tables
   i) Resizing rows/columns
   ii) Inserting rows/columns
   iii) Deleting rows/columns
   iv) Merging rows/columns
   v) Splitting rows/columns
- Formatting tables
   i) Borders
   ii) shading
- Table conversions
   i) Converting text to table
   ii) Converting table to text
   iii) Importing
- Arithmetic calculations
   i) Perform calculation
   ii) Insert formulae
- Sorting

4.1.26 Sorting creating and updating a mail merge document

- Creating main document
  - i) Form letters
  - ii) Labels
  - iii) envelopes
- create/import data source
  - i) editing
  - ii) saving
- Merging Fields
- Main and data source to
  - i) Printer or
  - ii) New window or
  - iii) Fax or
  - iv) E-mail
- Updating merged document

4.1.27 Printing a document

- i) Printer setup
- ii) Print preview
- iii) Print option
  - printer selection
  - orientation
  - page and copies
- iv) Printing

4.1.28 Inserting Graphics

- Types of graphics
  - i) Drawing
  - ii) Pictures
  - iii) Charts
- Inserting
  - i) importing
  - ii) drawing
- Editing graphical objects
  - i) Updating
  - ii) Resizing
  - iii) Enhance

4.2.0 SPREAD SHEET

4.2.1 Specific Objectives

By the end of the topic, the learner should be able to:

a) define a spreadsheet;
b) describe the components of a spreadsheet;
c) state the application areas of a spreadsheet;
d) create and edit a worksheet;
e) explain different cell data types;
f) apply cell referencing;

g) apply functions and formulae;
h) apply worksheet formatting;
i) apply data management skills;
j) apply charting and graphing skills;
k) print worksheet and graph.

4.2.2 Content

4.2.21 Definition of a Spreadsheet

4.2.22 Components of a spreadsheet
- i) worksheet
- ii) database
- iii) graphs

4.2.23 Application areas of a spreadsheet
- Statistical analysis
- Accounting
- Data management
- Forecasting (what if analysis)
- Scientific application

4.2.24 Creating a worksheet/workbook
- Getting started
- Worksheet layout
- Running the program
  - i) creating a worksheet
  - ii) editing a cell entity
  - iii) saving
  - iv) retrieving
  - v) closing a worksheet
  - vi) exiting from spreadsheet

4.2.25 Cell Data Types
- Labels
- Values
- Formulae
- Functions

4.2.26 Cell referencing
- Cell addressing
- Absolute referencing
- Relative referencing

4.2.27 Basic functions and formulae
- Functions
  - i) statistical (average, count, max, min)
  - ii) logical (if, count-if sum-if)
  - iii) mathematical (sum, product, div)
- Arithmetic formulae (using operators +,-,/,*, brackets)

4.2.28 Worksheet formatting

- Text
- Numbers
- Rows and columns
- Global

4.2.29 Data management

- Sorting
- Filtering
- Total/subtotals function
- Forms

4.2.30 Charts/graphs

- Types
- Data ranges
- Labels
- Headings and titles
- Legends

4.2.31 Printing

i) page set-up
ii) print preview
iii) print options

- select printer
- selection
- worksheet/workbook
- orientation
- pages and copies

v) printing

4.3.0 DATABASES

4.3.1 Specific Objectives

By the end of the topic, the learner should be able to:

a) define a database;
b) explain the concepts of a database;
c) explain data organization in a database;
d) create a database;
e) edit a database;
f) design a form;
g) apply basic concepts of queries;
h) create report and labels;
i) print queries, forms and reports.

4.3.2 Content

4.3.21 Definition of Database

4.3.22 Database concepts

- Traditional filing methods (manual flat files)
- Functions of databases

- Types of database models
- Database software
- Features of a database (e.g. data structures, report generating, querry language, modules)

4.3.23 Data Organization
- Character types
- Fields
- Records
- Files
- Database

4.3.24 Creating a database
- Design a database structure
- Field properties and data types
- Key-fields and index
- Data entry

4.3.25 Editing a database
- Modify structure
- Updating database

4.3.26 Form design
- Form layout
- Data manipulation
- Formatting fields

4.3.27 Queries
- Creating
- Updating
- Viewing
- Printing

4.3.28 Reports layout
- Creating (using relational and logical operator, local operators – AND OR, NOT)
- Modifying
- Sorting and grouping
- Labeling
- Printing

4.4.0 DESKTOP PUBLISHING (DTP)

4.4.1 Specific Objectives

By the end of the topic, the learner should be able to:

a) define desktop publishing;
b) state the purpose of DTP;
c) identify types of DTP software;
d) design a publication;
e) edit a publication;
f) format a publication;
g) print a publication.

4.4.2 Content

4.4.21 Definition of Desktop publishing

4.4.22 Purposes of DTP

- Graphic design
- Page layout design
- Printing

4.4.23 Types of DTP software

- Graphical based
- Layout based

4.4.24 Designing a publication

- Types of publications e.g. newsletters, cards, brochures, posters etc
- Running the program
- Screen layout
- Setting up a publication
- Manipulating text and graphics

4.4.25 Editing a publication

- Editing tools

4.4.26 Formatting a Publication

- Text
- Graphics

4.4.27 Printing

- Page set up
- Print options

4.5.0 INTERNET AND E-MAIL

4.5.1 Specific Objectives

By the end of the topic, the learner should be able to:

a) define internet;
b) explain the importance of internet;
c) describe internet connectivity;
d) identify internet services;
e) access internet;
f) use e-mail facilities;
g) state the moral, social and spiritual issues that may emerge through access to the internet.

4.5.2 Content

4.5.21 Definition of internet

4.5.22 Development of internet

4.5.23 Importance of internet

4.5.24 Internet connectivity

- Telecommunication facilities
- Modems

- Internet services providers (ISP)
- Internet software

4.5.25 Internet services e.g.
- World Wide Web (www)
- Electronic mail (e-mail)
- Electronic Commerce (e-commerce)
- Electronic Learning (e-learning)

4.5.26 Accessing Internet
- Log-in/sign-in
- Surf/browse
- Search engines and hyperlinks
- Downloading/saving/printing

4.5.27 Electronic Mail (e-mail)
- Definition
- E-mail software
- E-mail facilities
    i) Mails (checking, composing, forwarding, sending, saving and printing)
    ii) Fax
    iii) File attachment
    iv) On-line meetings
    v) Telephone messages
    vi) Contact management

NB: *Emphasis is on the procedure and not necessarily on on-line connectivity*

4.5.28 Use the internet to access information on emerging issues e.g.
- HIV/AIDS
- Drug abuse
- Environmental issues
- Moral integrity

5.0.0 DATA SECURITY AND CONTROLS

5.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a) define the terms data security and privacy;
b) identify security threats on ICT and possible control measures;
c) identify types of computer crimes.

5.2.0 Content

5.2.1 Definition of data security and privacy

5.2.2 Security threats and control measures
- Threats e.g.
    i) virus
    ii) unauthored access
    iii) computer errors and accidents

iv) theft

- Control measures e.g.
  - i) anti-virus software
  - ii) password
  - iii) user access levels
  - iv) backups

5.2.3 Computer crimes e.g.

- i) trespass
- ii) hacking
- iii) tapping
- iv) cracking
- v) piracy
- vi) fraud
- vii) sabotage
- viii) alteration

- Detection and Protection e.g.

- i) audit trail
- ii) data encryption
- iii) log files
- iv) firewalls

5.2.4 Laws governing protection of information systems

6.0.0 DATA REPRESENTATION IN A COMPUTER

6.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a) explain concepts and reasons for data representation in a computer
b) define the terms bit, byte, nibble and word
c) explain types of data representation in the computer
d) perform binary arithmetic operations.

6.2.0 Content

6.2.1 Concepts and Reasons of data representation

6.2.2 Definition of terms: bit, byte, nibble and word

6.2.3 Types of data representation.

- Number Systems and their representation of integral values
  - i) decimal
  - ii) binary
  - iii) octal
  - iv) hexadecimal
- Symbolic representation
  - i) Binary Coded Decimal Code (BCD)
  - ii) Extended Binary Coded Decimal Interchange Code (EBCDIC)
  - iii) American Standard Code for Information Interchange Code (ASCII)

6.2.4 Conversion between binary and decimal

6.2.4 Binary arithmetic operations
- Binary addition
- Binary subtraction

(i) ones complement
(ii) twos complement

7.0.0 DATA PROCESSING

7.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a) define the terms data, information and data processing;
b) describe data processing cycle;
c) explain types of errors in data processing;
d) explain the various methods of data processing;
e) describe data integrity;
f) describe a computer file;
g) describe types of computer files;
h) describe file organization methods;
i) describe the various data processing modes.

7.2.0 Content

7.2.1 Definition of the terms data, information and data processing

7.2.2 Data processing cycle
- Data collection
  - i) stages of data collection
  - ii) methods of data collection
- Data input
- Processing
- Output

7.2.3 Description of errors in data processing e.g.
- Transcription errors
- Transposition

7.2.4 Data processing methods
- Manual/conventional
- Mechanical
- Electronic

7.2.5 Data Integrity
- Accuracy
- Timeless
- Relevance

7.2.6 Computer files
- Elements of computer file
- Logical and physical files

7.2.7 Types of computer processing files e.g.
- Master

- Transaction
- Report
- Sort
- Backup
- Reference

7.2.8 File organization methods
- Sequential
- Random/direct
- Serial
- Indexed sequential

7.2.9 Electronic Data processing modes
- On-line
- Distributed
- Time-sharing
- Batch processing
- Multi-processing
- Multi programming/multi-tasking
- Interactive processing
- Real-time

8.0.0 ELEMENTARY PROGRAMMING PRINCIPLES

8.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a) define Programming;
b) describe the various levels of programming languages;
c) state the advantages and disadvantages of each level of the programming language;
d) define the terms assembler, compiler, interpreter, source program and object program;
e) describe the stages of program development;
f) describe the program control structures;
g) define and develop algorithm, pseudo-code and flowchart.

8.2.0 Content

8.2.1 Definition of Programming

8.2.2 Levels of programming languages
- Low level language

i) machine
ii) assembly

- High Level languages

i) third Generation Languages (3GLS)
ii) four Generation Languages (4 GLs)
iii) Object Oriented Programming (OOPs)
iv) Internet (scripting) Programming Languages

8.3.3 Advantages and disadvantages of low and high level languages

8.4.4 Description of terms

i) assembler
ii) compiler
iii) interpreter
iv) source program
v) object program

8.4.5 program development

- problem recognition
- problem definition
- program design
- program coding
- program testing
- implementation

8.4.6 Program Control Structure

- Sequence
- Selection
- Iteration (looping)

8.6.7 Definition and development of Algorithm

- Pseudo-code
- Flow chart

9.0.0 SYSTEM DEVELOPMENT

9.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a) describe a system;
b) define an information system;
c) state the purpose of an information system;
d) identify the stages of system development;
e) develop a system using a case study;
f) write a report on the case study.

9.2.0 Content

9.2.1 Description of a system

9.2.2 Definition of an Information System

9.2.3 Purpose of an Information System

9.2.4 Stages of system development

- Problem recognition and definition
- Information gathering e.g
  i) investigation
  ii) observation
  iii) interviews
  iv) questionnaires
- Requirement specification for the new system
- System design

- System construction
- System implementation
- System review and maintenance
  (*A number of theories exist on system development. The above is a general guide to the stages)

9.2.5 System Documentation

- Reports on fact finding/information gathering
- System flowchart
- Table/file structure/descriptions
- Sample data
- Output reports
- User manual

10.0.0 INTRODUCTION TO NETWORKING AND DATA COMMUNICATION

10.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a) define computer networking TERMS;
b) state the purpose of computer networks;
c) describe the elements of a network;
d) describe various types of networks;
e) describe various types of network topologies.

10.2.0 Content

10.2.1 Definition of terms

i) computer networks
ii) data communication

10.2.2 Purpose and Limitations of networking

- Purpose
  i) resource sharing
  ii) remote communication
  iii) distributed processing facilities
  iv) const effectiveness
  v) reliability
- Limitations

10.2.3 Elements of Networking

a) Data communication media

- Communication with cables
  i) twisted pair cables
  ii) coaxial cables
  ii) fibre-optic cables
- Communication without cables (wireless) e.g.

  i) Microwave
  ii) satellite
  iii) radio transmission

b) Data Signal
- Analog
- Digital

c) Communication Devices e.g.
- Modems
- Network cards
- Hubs

d) Network software
- Operating systems
- Protocols

10.2.4 Types of Networks
- Local Area Network (LAN)
- Metropolitan area Network (MAN)
- Wide Area Network (WAN)

10.2.4 Types of Network topologies e.g.
- Ring
- Star
- Bus

11.0.0 APPLICATION AREAS OF INFORMATION AND COMMUNICATION TECHNOLOGY

11.1.0 Specific Objectives

By the end of the topic, the learner should be able to describe the use of computers in different application areas.

11.2.0 Content

11.2.1 Application Areas of Information and Communication Technology
- Financial Systems
  a) accounting
  b) banking
  c) payroll
- Retail Systems
  i) point of sale systems
  ii) stock control
- Reservations Systems
  i) hotels
  ii) air-lines
- Communication Systems
  i) fax and telex
  vi) radio
  vii) television
  viii) video conferencing
  ix) e-mail
  x) telecommuting

xi) internet

- Education
  i) Computer Aided Learning (CAL)
  ii) e-learning
  iii) computer based simulation
- Industrial systems
  i) simulation
  ii) process control
  iii) CAD (Computer Aided Design)/CAM (Computer Aided Manufacture)
- Scientific and Research Systems
  i) weather forecasting
  ii) medical research
  iii) military/space exploration
- Transportation Systems
  i) air-traffic control
  ii) shipping control
  iii) automobile traffic control
- Entertainment Systems
  i) computers and movies
  ii) multi-media
- Virtual reality
  i) uses of virtual reality
  ii) visor
- Library Systems
  Library lending system
- Home use
- Health
- Expert systems
- Offices
  Expert systems
- Offices
  Expert systems
- Marketing
  i) e-commerce
  ii) business

11.2.2 Fieldwork Report

12.0.0 IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ON SOCIETY

12.1.0 Specific Objectives

By the end of the topic, the learner should be able to:

a) identify issues resulting from the use of ICT;
b) discuss future trends in ICT.

12.2.0 Content

12.2.1 Issues resulting from use of ICT

a) Effects on employment
- job creation
- job replacement
- job displacement

b) Automated production
- pros & cons

c) Issues of workers health

d) Breakthroughs
- Health care
- Education
- Communication
- Research
- Commerce
- Arts
- Entertainment
- Transport

e) Cultural effects
- Computer crimes
- Moral effects

12.2.2 Evolution of computer systems
- Possible future trends in capabilities, physical size, price, software etc
- Artificial intelligence

i) expert systems
ii) natural language processing
iii) artificial neural networks
iv) robotics

13.0.0 CAREER OPPORTUNITIES IN ICT

13.1.0 Specific Objectives

By the end of the topic, the learner should be able to describe career opportunities in ICT.

13.2.0 Content

13.2.1 Description of careers in the field of ICT e.g.

i) Computer Operators
ii) Programmers
iii) Software Engineers
iv) Database Administrators
v) System Administrators
vi) Computer Technicians
vii) Computer Engineers
viii) Information Systems Managers
ix) Computer Trainers

x) Web Administrators
xi) Systems Analysts

13.2.2 Identification of further Educational Opportunities

i) Colleges
ii) Institutions
iii) Polytechnics
iv) Universities
v) Research Institutions

14.0.0 PROJECT

14.1.0 Specific Objectives

By the end of the Project, the learner should be able to:

a) identify and define a problem;
b) carry out fact finding through either or all of these methods:
  i) investigation
  ii) observation
  iii) interviews
  iv) questionnaires;
c) define systems hardware and software requirement;
d) design a system;
e) construct a system that would:
  i) input data through forms or screen
  ii) update: modification, deletion of existing data
  iii) carry out data validation
  iv) search/filter/query/retrieve records
  v) generate/print reports.
f) test the system;
g) prepare a project report (documentation) that includes
  i) reports on fact finding system flowchart/flow diagram
  ii) system flowchart/flow diagram
  iii) table/file structure descriptions
  iv) sample input and test data
  v) output reports
  vi) user manual.

GENERAL REQUIREMENTS

Schools intending to offer Computer Studies are expected to have the following minimum equipment:

i) Computer Laboratory/classroom(s)
ii) Computer desks that accommodate monitor at eye level

iii) At least one computer per every four students (1:4) in Forms one and two and one computer for every two students (1:2) for Forms three and four.
iv) At least one printer for every four computers
v) Printing Stationery
vi) Appropriate storage devices e.g. diskettes
vii) Storage facilities for diskettes and other consumables e.g. disk banks
viii) Appropriate software for the curriculum
ix) Relevant reference materials

Note: *The computers to be used for the course should preferably be IBMs or IBM-compatibles due to their low maintenance costs and availability of spare parts.*

In addition to the above, the following facilities though not mandatory will greatly assist in achieving the objectives of the course.

1. HARDWARE

i) The PCs should be Pentium II or higher
ii) The PCs should have a CD-ROM drive
iii) At least one of the PCs in the school should be full multimedia
iv) A network environment
v) Internet connection
vii) Printers with graphic capabilities (not necessarily in colour)

2. SOFTWARE

i) It is recommended though not necessary that the operating system be a Graphical User Interface (GUI)
ii) Software for the application packages may also be GUI – based which supports pointing devices
iii) Up to date anti-virus software are highly recommended.