

# SECTION 1: FUNDAMENTALS OF HARDWARE AND SOFTWARE

## GENERAL OBJECTIVES

On completion of this Section, students should:

1. appreciate the fundamental hardware and software terminologies and concepts;
2. *develop* expertise in the operation and use of microcomputer-based systems.

## SPECIFIC OBJECTIVES

## CONTENT

Students should be able to:

- |    |                                                                                                       |                                                                                                                                                                                                                                                                                                                             |
|----|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | describe a <i>general-purpose</i> computer system;                                                    | Major functions of systems: input, processing, output, storage.                                                                                                                                                                                                                                                             |
| 2. | <i>explain</i> the functions of the major hardware components of a computer system;                   | Central Processing Unit (CPU): control unit and ALU; main memory/immediate access storage, secondary storage, input/output devices.                                                                                                                                                                                         |
| 3. | <i>outline</i> the functions and uses of primary storage devices;                                     | Bistable devices, PROM, EPROM, RAM, ROM.                                                                                                                                                                                                                                                                                    |
| 4. | <i>manipulate units of storage</i> ;                                                                  | <i>Bit, byte, kilobyte, megabyte, gigabyte, terabyte, word, word size.</i>                                                                                                                                                                                                                                                  |
| 5. | <i>compare the types of secondary storage media with respect to portability, speed and capacity</i> ; | <i>Magnetic tape, floppy disk, hard disk (fixed head, moving head, external), optical disks (CD, DVD), flash drive, flash memory cards.</i>                                                                                                                                                                                 |
| 6. | use terms associated with storage devices;                                                            | Read/write head, sectors, tracks, buffers, cylinders, access time, sequential access, direct access; <i>device interfaces such as: SCSI, IDE, SATA.</i>                                                                                                                                                                     |
| 7. | <i>explain the uses of various input devices and media</i> ;                                          | Optical mark reader (OMR), character readers (OCR, MICR), mouse, joystick, <i>bar code reader, document scanner, light-pen, touch terminals, voice response unit, pads and tablets, point of sale (POS), keyboard, digital camera, biometric systems, sensors, remote control, sound capture, pointing devices, webcam.</i> |

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

- |     |                                                                              |                                                                                                                                                                                                                                                                                                                                                                                 |
|-----|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.  | <i>state the types and functions of output devices;</i>                      | <i>Visual display unit: resolution, types, sizes. Printers: impact and non-impact, types: (character, line, page, laser, inkjet, dot matrix). Characteristics: (speed, quality, storage capacity); plotters; audio output devices (for example, speakers, head-phones, earphones); microfilm. Also terms such as hard copy, soft copy, human readable and machine-readable.</i> |
| 9.  | <i>describe how data are stored and manipulated within the computer;</i>     | <i>Binary, octal and hexadecimal number systems; binary addition and subtraction. Integers (positive and negative): sign and magnitude, BCD, two's complement; representation of characters, ASCII.</i>                                                                                                                                                                         |
| 10. | <i>interpret the hardware specifications of a computer system;</i>           | <i>CPU type and speed; memory: capacity, type, word size, speed. Hard drive: capacity, speed; fire wire, expansion slots, ports.</i>                                                                                                                                                                                                                                            |
| 11. | <i>distinguish between systems programs and application programs;</i>        | <i>Systems software: operating systems, translators, utilities; Application software: general purpose, special purpose, custom written. Customization, integrated software.</i>                                                                                                                                                                                                 |
| 12. | <i>explain the functions of an operating system;</i>                         | <i>File management, memory management, security, device management, input/output management, user interface, process management.</i>                                                                                                                                                                                                                                            |
| 13. | <i>distinguish among multitasking, multiprocessing and multiprogramming;</i> | <i>Basic treatment of these terms. (See glossary).</i>                                                                                                                                                                                                                                                                                                                          |
| 14. | <i>explain the different types of processing modes;</i>                      | <i>Batch processing, real-time, on-line, time-sharing.</i>                                                                                                                                                                                                                                                                                                                      |
| 15. | <i>distinguish between types of user interface.</i>                          | <i>Software interface: Command driven, graphical user interface (GUI) (menu driven, pull-down and pop-up menus, icons). Hardware interface: touch screens, non-visual interface, sensors, and Braille keyboards.</i>                                                                                                                                                            |

## SECTION 2: *PROBLEM-SOLVING AND PROGRAM DESIGN*

### GENERAL OBJECTIVE

On completion of this Section, students should have an understanding of the fundamental principles and practices of *problem-solving on the computer*.

### SPECIFIC OBJECTIVES

### CONTENT

Students should be able to:

- outline the steps in problem-solving;* *Definition of the problem; propose and evaluate solutions; determination of the most efficient solution; develop and represent algorithm; test and validate the solution.*
- decompose a simple problem into its significant parts;* *The components are: input; process; storage; output.*
- distinguish between variables and constants;* *Variables as an area of storage whose value can change during processing; the value of a constant never changes.*
- use appropriate data types;* *Integers, floating point (real), characters, literals.*
- explain the concept of algorithms;* *Definition of algorithms; Characteristics: finite number of steps, precise, unambiguous, flow of control from one process to another, terminate.*
- identify ways of representing algorithms;* *Representation of algorithms as Pseudocode or Flowcharts; Use of flowchart symbols: input/output, process, decision, directional arrows. Pseudocode - Use of: Read, Input, Store Write, Output, Display, If-then; If-then-else; For loop; while loop; (questions which require nested conditionals or nested loops will not be asked).*  
  
Truth Tables  
*Use of relational operators: <, >, =, <=, >=, <>.*  
*Logical operators: AND, OR, NOT.*  
*Arithmetic operators: +, -, \*, /.*  
*Simple problems including: average, maximum.*
- develop algorithms to solve simple problems;* *Use of problem-solving techniques outlined in Specific Objective 1 to the solution of simple problems.*

# PROBLEM-SOLVING AND PROGRAM DESIGN (cont'd)

## SPECIFIC OBJECTIVES

## CONTENT

*Students should be able to:*

- |    |                                                             |                                                                                                                                                                                          |
|----|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8. | test algorithms for correctness;                            | <i>Construction and use of trace tables to determine result. Trace table consists of variable names (identifiers) as column headings and values in the cells, one row for each pass.</i> |
| 9. | <i>use the top-down design approach to problem solving.</i> | <i>Application of stepwise refinement to problems with two or more tasks.</i>                                                                                                            |

## SECTION 3: PROGRAM IMPLEMENTATION

### GENERAL OBJECTIVE

On completion of this Section, students should have an understanding of how to convert algorithms to programs using structured programming techniques.

### SPECIFIC OBJECTIVES

### CONTENT

Students should be able to:

1. distinguish between low-level and high-level programming languages; Low-level language (Machine or Assembly Language); High-level language (Pascal, C).
2. distinguish among the different generations of programming languages; Characterization of first through to fifth generation languages.
3. list the sequence of steps associated with implementing a program; Create source code, compile, linking, executing, maintain program.
4. explain commonly used terms and concepts in programming; Testing, debugging, syntax errors, logic errors, run-time errors, dry run, test data.
5. declare elementary data types; Integers, real numbers, characters.
6. declare variables and constants; Use of meaningful variable names and constants; assign initial values.
7. manipulate data; Reading from and writing to variables, arithmetic operations.
8. use control structures; Conditional branching: if-then, if-then-else, Loops: while, repeat, for.
9. manipulate data in a list; Declare 1-dimensional arrays; reading from and writing to arrays; traversing arrays; linear search.
10. perform checks and tests on programs to verify correctness; Testing and debugging techniques.
11. write documented programs. Importance of documentation; features of internal documentation (use of mnemonic names, use of comments, indentation, effective use of white spaces); external documentation (user manuals).

# ◆ SECTION 4: APPLICATIONS AND IMPLICATIONS OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

## GENERAL OBJECTIVES

On completion of this Section, students should develop an awareness of:

1. the use of the computer and the implications of that use;
2. trends in Internet and Communications Technology;
3. careers in the field of Information Technology.

## A: INTERNET AND COMMUNICATIONS TECHNOLOGY

### SPECIFIC OBJECTIVES

### CONTENT

Students should be able to:

- |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. use terms associated with data communications and networks;   | Definitions of data communication and network; types of networks: (local area network, wide area network, metropolitan area network), types of transmission media: cable/wired media (coaxial, fibre-optic, twisted pair), wireless media (satellite, microwave, infra-red), wireless network technology: (Bluetooth, Wi-Fi), hotspot, modem, bandwidth (broadband, narrowband, voiceband), communication modes: (simplex, duplex, half duplex), point-to-point, and broadcast. |
| 2. distinguish among Internet, intranet and extranet;            | Refer to glossary.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 3. explain concepts associated with the Internet;                | Including Electronic mail (e-mail), newsgroups, Internet Relay Chat (IRC), Telnet, File Transfer Protocol (FTP), upload, download, World Wide Web (WWW), web browser, HTTP, Hypertext Markup Language (HTML/XHTML), web page, website, blogging, webserver, URL, e-commerce, e-learning, HTTP, podcasting, bulletin board, VoIP.                                                                                                                                                |
| 4. describe measures to secure data and maintain data integrity; | Software Restrictions: passwords, encryption, virus protection, firewall; physical access restrictions: biometric systems, guards, locks; fire/water proof cabinets; archiving; backup and recovery procedures; propriety data and software.                                                                                                                                                                                                                                    |

# APPLICATIONS AND IMPLICATIONS OF INFORMATION AND COMMUNICATIONS TECHNOLOGY (cont'd)

## B: APPLICATIONS AND IMPLICATIONS

### SPECIFIC OBJECTIVES

### CONTENT

Students should be able to:

- |    |                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                |
|----|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5. | <i>outline ways by which</i> information can be misused;                                        | <i>Violation of privacy, propaganda, software piracy, computer fraud, electronic eavesdropping, industrial espionage, surveillance, storage of inaccurate information, identity theft, credit card fraud.</i>                                                                                                                                                                  |
| 6. | describe appropriate hardware and software to meet the particular needs of a given application; | <i>Projects to determine the relevant hardware and software (open source vs. proprietary) used in areas including business, industry, science and technology, education, law enforcement, recreation, music, gaming.</i>                                                                                                                                                       |
| 7. | <i>describe current and emerging</i> technological trends;                                      | <i>Expert systems, robots, CADD, CAE, CAM, telemarketing, teleconferencing.</i>                                                                                                                                                                                                                                                                                                |
| 8. | assess the impact of Information Technology on job skills and careers;                          | Computer skills used by office employees, teachers, engineers, medical personnel, musicians, mass media personnel, law enforcement personnel, movie industry; loss of jobs; retraining; telecommuting.                                                                                                                                                                         |
| 9. | describe the roles of various personnel in computer-related professions.                        | <i>The functions of individuals in computer-related fields: programmers, systems analysts and designers, IT managers, systems programmers, database administrators, network administrators, IT managers, file librarians, computer technicians, computer engineers, software engineers, software testers, webmaster, web-developer, software trainer, multi-media artists.</i> |

# SECTION 5: INFORMATION PROCESSING

## GENERAL OBJECTIVE

On completion of this Section, students should develop an understanding of the principles, organization and operation of Information Processing Systems.

### SPECIFIC OBJECTIVES

### CONTENT

Students should be able to:

- |    |                                                                                      |                                                                                                                                                                                 |
|----|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <i>distinguish between data and information;</i>                                     | Data as raw unprocessed facts; information as processed data.                                                                                                                   |
| 2. | explain the characteristics and functions of Information Processing;                 | <i>Forms of Information Processing: automation, process control, commercial, industrial, and scientific data processing; information retrieval and management.</i>              |
| 3. | identify the sources of data in specified application areas;                         | Source document, turnaround document, machine and human readable document.                                                                                                      |
| 4. | describe methods of validation and verification of data;                             | Difference between validation and verification. Methods: range check, reasonableness checks, data type checks, inconsistency checks.                                            |
| 5. | identify appropriate verification and validation checks given a particular scenario; | <i>Such as double entry to identify and correct typographical/transposition errors.</i>                                                                                         |
| 6. | describe various methods of file organization and access;                            | Sequential field ordering; random, index-sequential; <i>direct-access, sequential-access.</i>                                                                                   |
| 7. | select appropriate file organization for particular application.                     | <i>Associate an appropriate file structure and access method to a specific application. For example, a payroll file would be organized sequentially with sequential access.</i> |



# ◆ SECTION 6: WORDPROCESSING, PRESENTATION AND WEB PAGE DESIGN

## GENERAL OBJECTIVE

On completion of this Section, students should have hands-on experience in the use of Wordprocessing, Presentation and Web Page Design packages in the development of computer-generated documents and be able to express their aptitude and creativity in design.

## A: WORDPROCESSING

### SPECIFIC OBJECTIVES

### CONTENT

Students should be able to:

- |                                                                              |                                                                                                                                                            |
|------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. select appropriate editing features in the preparation of a document;     | Deleting and inserting characters, words, lines, sentences, paragraphs. Type-over mode. Selecting blocks of text. Copying and moving sections of text.     |
| 2. describe commonly available features;                                     | Page numbers, page breaks, text alignment, wordwrap, margins, tabs, page length, default settings, font size.                                              |
| 3. select appropriate formatting features for the preparation of a document; | Margins, tab stops, line spacing, page breaks, page numbers, left and right justification, centre line, underline, highlight, uppercase, bold, and italic. |
| 4. use headers, footers, footnotes and endnotes appropriately;               |                                                                                                                                                            |
| 5. combine documents;                                                        |                                                                                                                                                            |
| 6. perform block operations;                                                 |                                                                                                                                                            |
| 7. use columns and tables appropriately;                                     |                                                                                                                                                            |
| 8. apply appropriate character formatting features;                          | Underline, bold, italics, font types and sizes, superscript and subscript.                                                                                 |
| 9. use search and replace functions appropriately;                           |                                                                                                                                                            |
| 10. use mail-merge facilities;                                               | Creation of primary documents and data files in mail merge application; Field names.                                                                       |
| 11. use spell-check;                                                         |                                                                                                                                                            |
| 12. import documents;                                                        | Text files, graphics, tables including options such as automatic save and backup copy, password protection, track changes.                                 |

## WORDPROCESSING, PRESENTATION AND WEB PAGE DESIGN (cont'd)

### B: PRESENTATION

#### SPECIFIC OBJECTIVES

#### CONTENT

Students should be able to:

- |     |                                                                     |                                                                                                                                                     |
|-----|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 13. | <i>explain the uses of presentation software;</i>                   | <i>For example, to enhance public speaking; to deliver lectures; to present project reports; to effectively present sales or marketing ideas.</i>   |
| 14. | <i>explain the concepts of wizards, templates and slides;</i>       |                                                                                                                                                     |
| 15. | <i>choose appropriate slide layout;</i>                             | <i>Slide layout must relate to the type of information being presented.</i>                                                                         |
| 16. | <i>apply design templates to slides;</i>                            | <i>Choosing from a list of presentation designs.</i>                                                                                                |
| 17. | <i>use formatting features effectively to enhance presentation;</i> | <i>Changing background colour, font size and other attributes, such as font colour and bullets.</i>                                                 |
| 18. | <i>create slide headers and footers;</i>                            | <i>Use of the slide master to personalize the slides.</i>                                                                                           |
| 19. | <i>create and use speaker notes;</i>                                |                                                                                                                                                     |
| 20. | <i>apply various types of animation effects to slides;</i>          | <i>Flying, drive-in, camera effects; flash-once, typewriter; laser, reverse-texts, drop-in effects. Custom animation; timing and sound effects.</i> |
| 21. | <i>insert graphics and moving pictures into a slide;</i>            |                                                                                                                                                     |
| 22. | <i>manipulate multiple slides;</i>                                  | <i>Insertion and deletion of slides; use of the slide sorter.</i>                                                                                   |
| 23. | <i>present a slide show.</i>                                        | <i>Use of slide show tools such as slide navigator, pointer options, screen attributes.</i>                                                         |

**C: WEB PAGE DESIGN**

*This section provides students with hands-on experience in the use of web design software to create and maintain simple websites.*

**SPECIFIC OBJECTIVES**

**CONTENT**

Students should be able to:

- |                                            |                                                                                                                                                                             |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 24. <i>plan the website;</i>               | <i>Reasons for the website; the intended audience; number of web pages desired; content of each page; layout of the web pages.</i>                                          |
| 25. <i>create a simple web page;</i>       | <i>Choosing an appropriate design for a page; inserting and deleting text and graphics; wrap text with image; create thumbnail image, index page, home page, hyperlink.</i> |
| 26. <i>create hyperlinks;</i>              | <i>Linking to another web page; link to a location within the web page; link to an email address; link to user-created files.</i>                                           |
| 27. <i>test the website;</i>               | <i>Use of a web browser; verify that all the hyperlinks work correctly; use a test audience.</i>                                                                            |
| 28. <i>publish and maintain a website.</i> | <i>Registering domain names; locate hosting company; the use of the file transfer protocol (FTP) for uploading files.</i>                                                   |

# SECTION 7: SPREADSHEETS

## GENERAL OBJECTIVE

On completion of this Section, students should develop expertise in the use of a spreadsheet package in the development of computer applications.

### SPECIFIC OBJECTIVES

### CONTENT

Students should be able to:

1. *explain the purpose of a spreadsheet;* Definition of spreadsheet: a spreadsheet is a table consisting of cells (rows, column locations) that hold accounting or financial data and simulates the traditional physical spreadsheet; it captures displays and manipulates data.
2. *use appropriate terminology and notions commonly associated with spreadsheets;* Row, column, cell, cell address, label, value, formula, function, worksheet, template, range, title, window, record.
3. *select basic pre-defined systems functions;* Including sum, average, date, maximum, minimum, count, if, vlookup, rank.
4. *create advanced arithmetic formulae;* Formulae involving addition, subtraction; multiplication; division; powers; square roots, the use of brackets.
5. *explain the use of common features of spreadsheet software;* Row/column title locking, relative addressing, absolute addressing.
6. *invoke row and column title locking;* Horizontal, vertical, both.
7. *replicate (copy) formulae into other cells;* Relative versus absolute addressing.
8. *manipulate data on a spreadsheet;* Effects of move, copy, delete operations on formulae.
9. *manipulate columns and rows;* Insert and delete columns and rows.
10. *format a spreadsheet;* Numeric data formatting, text formatting, alignment, borders.
11. *sort a spreadsheet;* Primary field, secondary field, ascending vs. descending order.

## SPREADSHEETS (cont'd)

### SPECIFIC OBJECTIVES

### CONTENT

Students should be able:

- |     |                                                             |                                                                                                                            |
|-----|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| 12. | <i>find a record matching a given criterion;</i>            | Simple criterion, complex criterion, record - find command.                                                                |
| 13. | <i>perform charting operations;</i>                         | Bar charts, line graphs, pie charts, graph titles, labels on axes.                                                         |
| 14. | <i>select appropriate graphical representation of data;</i> |                                                                                                                            |
| 15. | <i>manipulate multiple worksheets;</i>                      | <i>Use of two or more worksheets to solve problems involving some or all of the functions and operations listed above.</i> |
| 16. | <i>import files.</i>                                        | Graphics, tables.                                                                                                          |

## SECTION 8: DATABASE MANAGEMENT

### GENERAL OBJECTIVE

On completion of this Section, students should develop expertise in the design of a database management system in the development of computer applications.

### SPECIFIC OBJECTIVES

### CONTENT

Students should be able to:

1. *explain the concept of a database;* Definition of database: repository of information; collection of tables that are related to each other.
2. *use terminology commonly associated with a database;* Database terminology: table (relation), entity, tuple, attribute, primary key, secondary key, composite key, candidate key, alternate key, foreign key.
3. *distinguish among terminology associated with files and databases;* Row (tuple, record), column (attribute, field), key. Data types: alphanumeric; numeric; data; logical.
4. *outline the advantages and limitations of databases;* Comparison with files with regards to: Speed; Ad hoc queries; standardization; present multiple views of the same data.
5. *create a database;* Table structure with at least three data types and populate with at least twenty-five records. Use of wizard is prohibited.
6. *modify a table structure;* Adding new fields, deleting fields, changing field definitions.
7. *sort a database;* Arranging data in numeric, alphabetic; or alphanumeric format. Report generating facilities of the database package, including use of sorting, grouping statistical and summary features, for example, count, sum and average.
8. *establish relationships;* Use of joins, merge tables/files.
9. *query a database using multiple search conditions;* Using more than one criterion; use of select, calculated fields.

# DATABASE MANAGEMENT (cont'd)

## SPECIFIC OBJECTIVES

## CONTENT

Students should be able to:

10. determine the results of a search on a database given multiple conditions; *Two or more fields involving the use of relational and logical operators.*
11. generate reports to the screen, printer and files. *Report generating facilities of the database package, including use of sorting, grouping, statistical and summary features, for example, count, sum and average.*