Introduction to Computer Systems

The computer system as an information processing machine. Its tasks of handling information: input, process, output, store, retrieve, send and receive.

*Data and Information.*

*Hardware and Software. Peripherals.*

CPU, I/O Sub-system, main and backing store. Flow of data and control between the main units using buses.

*The block diagram should include I/O devices.*

*At this instance in time the I/O sub-system should be treated as a 'black box' and flow lines indicate the flow of data.*

Different types of computers (mainframe, super, mini, micro)

Analogue and Digital Data

Distinction between analogue and discrete (digital) processes and quantities. Conversion of analogue quantities to digital form using sampling techniques. Use of 2-state electronic systems (logic 0 and logic 1) for reliability.
Examples of digital and analogue systems/processes.

- System Software Utilities

  Utilities that come bundled with OS and as separate packages.

  Function of each utility.

  Format

  Scandisk

  Defragmentation

  Antivirus

  Compression software (e.g. Winzip)

- Computer Arithmetic:

  Representation of numbers in binary.

  Conversion between decimal and binary, and between binary and hexadecimal. Use of subscripts 2, 10 and 16 for bases.

  Also to include conversion between hex and decimal. The MSB and LSB
- **Registers and units of storage**

Units of storage: bit, byte, kilobyte, megabyte, gigabyte and terabyte.

*Storage space of typical media.*

- **Ascii Code**

Representation of text using an 8-bit coding system e.g. ASCII.

*Other representations of a code.*

Importance of collating sequence in a character-coding system (e.g. ASCII code).

Problems with representing international character sets.

*The Unicode*

- **Logic Gates and Truth Tables**

Truth values (0/1, T/F, on/off).

   - OR, AND (2-input only) and NOT gates and their truth tables.

Determining the output of a logic circuit for the 3 mentioned gates. *(Construction of truth table for a logic circuit which may have 2/3 inputs).*
Truth tables using true/false.

- Methods of Access

Serial and direct access and their suitability of use for certain applications (eg. Serial for payrolls, direct for airline booking reservations).

- Main Memory and Storage Devices

Main/primary memory – RAM volatile and writeable and ROM non-volatile and non-writeable.

Uses of each (eg bootstrap loader in ROM and running programs in RAM).

Secondary/backing storage devices and media. *Speed difference between main and secondary storage.*

Magnetic media (hard disks, tapes, etc).

Optical media (CD-ROM, DVD-ROM, etc).

Electronic media (pendrives, etc).

Uses of each, relative capacities (eg *hard disk higher capacity than CD-ROM*), relative speeds (eg *DVD-ROM is slower than pendrive*) and access modes (direct vs sequential). How a disk drive works – read/write heads, tracks, sectors.

*The difference between a backing storage medium and data backup.*
The disk filing system - storage blocks *(smallest unit of data that can be transferred)*, disk directory, file allocation *(NTFS, FAT)*.

Hierarchical directory structure. Access time *(typically, short or long only)*.

- **Input Devices**
  
  Different types of input devices and the application areas for which each is best suited.

  Qwerty keyboard – alphanumeric and special keys.

  Pointing devices - mouse, trackball, trackpoint, touchpad, light pen and touch screen.

  Bar code reader, graphics tablet, image *(optical)* scanner and digital camera.

  Application of input devices such as OMR,

  MICR and OCR software, handwriting recognition and pen computing.

  Joystick, games paddle and audio input *(microphone)*.

  *Electronic cards *(magnetic and chipped)*.*

- **Output Devices**
  
  Distinction between hard copy and soft copy and between vector devices *(eg. plotter)* and raster devices *(eg. laser printer and screen)*.

  Resolution of a raster device *(pixels or dots per unit length)* and how this relates to the print quality and amount of data that
needs to be transferred from the computer to the device (and hence speed).

LCD projectors.

Dot-matrix, inkjet and laser printers (*impact and non-impact*)

Plotter.

VDU/Monitor.

Audio output (loudspeaker)

- Special Purpose Input and Output Devices
- Accessibility Options in Software

This section is intended to make students aware that people with special needs can still use computers through special devices. Braille printers and keyboards, special purpose keyboards, eye sensor readers and speech recognition.

- Resolution and Monitors
- Buffer and Cache
- Serial and Parallel Access

How an image is displayed on a CRT, FPD (Flat Panel Display) or LCD. Pixels and colour depth.

Palettes.

- Databases

  *The difference between database and DBMS.*

  The organization of data: files (tables), records, fields, items, key fields.

  *File Specifications.*

  *Field types to include numeric, text, Boolean (yes/no) and date.*

  Updating the data base, inserting *(appending)* new records, deleting unwanted records and changing *(editing)* items and fields.

  Sorting a file according to some criteria eg alphabetically by name. Sorting by more than one field.

  Forms: Displaying or printing of chosen fields from selected records or from all records.

  Queries: selecting records under certain conditions.

  Reports: retrieval of records to view on computer system or print.

  Relational database: concept of tables and relationships (1-to-1 and 1-to-many).

  Fixed length and variable length records.
Importance of speed of response and file structure (serial and direct access) and their applications.

- **Problem Solving**
  
  Analyse the requirements of a problem and create specifications and target for the solution. Specifications should concentrate on inputs and outputs.
  
  The development of algorithms.
  
  The use of flow charts for describing an algorithm.
  
  The use of structure diagrams and pseudocode for describing an algorithm.

- **Effects of Computerisation**
  
  Positive and negative effects of computerisation, eg. satisfaction and efficiency at work, effects of computer games on youngsters, health hazards from working long hours at a computer, opportunity for crime.