Week One Lecture Note

**1.0   INTRODUCTION TO COMPUTER**

1.1   WHAT IS COMPUTER?

A Computer is a device or set of devices that work under the control of a stored program, automatically accepts and processes data to provide information.

- Automatic: it carries out instructions with minimum human intervention
- Re-programmable: it stores instruction (the program)
- A data processor: it carries out operations on data (numbers or words) made up of a combination of digits to produce information.

Data is the name given to facts. Information is the meaningful data that is relevant, accurate, up to date and can be used to make decisions.

A computer accepts and then processes input data according to the instructions it is given. The elements of any sort of processing are INPUT, PROCESSING, STORAGE, and OUTPUT that can be depicted as shown in the following diagram.
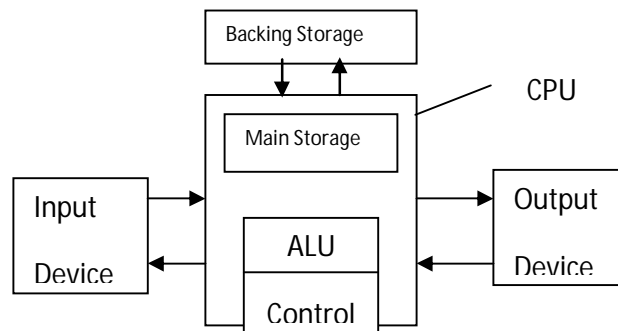
A Computer operations are performed according to programmed logical and arithmetical rules. The arithmetical element might be as simple as $x + y = z$. The logic will be something along the lines of if $x + y$ does not equal z then add 3 to x and try again.

A Program is a set of coded instructions, which tells the computer what to do. For as long as the Instructions are being carried out they are usually held in the computers internal storage or

memory. A Computer is therefore a mixture of physical, tangible things like keyboards, mouse, monitors, internal circuits and communication media referred to as HARDWARE and intangible things like stored programs referred to as SOFTWARE. Using electrical impulses, the two are connected and communicate with each other.

1.2   CLASSIFICATION OF COMPUTERS

Computer can be classified into three aspects:

- Representation of numbers
- Degree of specialization
- Types of application

Representation of Numbers

 There are three basic aspects of Computers, which are digital, analog and hybrid.

Digital Computer: This aspect of computer operates on numbers directly. It handles numbers discretely and precisely rather than approximately.

Examples of digital computers are digital watch, digital phone and digital radio.

Analog Computer: This aspect of computer deals with quantities that are continuously variable e.g. speedometer, electric meter, water meter, thermometer.

Hybrid Computer: This computer combines the features of both analog and digital computers. They handle data in both quantities and variable.

Degree of Specialization

There are two basic types – special and general-purpose computer.

Special Purpose Computer: This aspect of computer is designed to perform one or specific task. The program of this aspect of computer is in-built into the machine permanently. For instance, special purpose computers are used for solving navigation problems in aircraft and ships.

General Purpose Computer: These computers have the ability to handle a wide variety of different programs and to solve many different problems.

Types of Application
There are two types – Scientific and Business Applications.

Scientific Applications: These computers are designed to handle scientific application more effectively. They require small volume of data input and output.

Business Data-Processing Application: These computers are designed to handle business data processing applications. They need a large data file, input storage, output storage devices and large storage capabilities.

1.3   **Types of Computers**

They are many types of computers and they include:

➢ Mainframe computers
➢ Mini - Computers, now often called "Mid-Range" Computers
➢ Micro - Computers, now commonly called Personal Computers (PC)
➢ Super computers

Mainframe Computer system is one that has at its heart a very powerful central computer linked by cable or telecommunications to hundreds or thousands of terminals and capable of accepting simultaneous input from all of them. A mainframes has many times more processing power than a PC and offers very extensive data storage facilities. Mainframe Computers are used by organizations such as banks that have very large volumes of processing to perform and have special security needs.

Many organizations have now replaced their old mainframe with network "client server" systems of Mini Computers and PCs because this approach - called downsizing is thought to be cheaper and offer greater reliability, functionality and data security than networked systems.

Minicomputer is a computer whose size, speed and capabilities lie between those of a mainframe and PC. The advent of more powerful chips now means that some 'Super Minis' and even PCs linked in a network can run more powerfully than small mainframe. The advent of PCs and with mainframes now being physically smaller than in the past, the definition of a Mini-Computer has become rather vague. There is really no definition, which distinguishes adequately between a PC and a mini computers include IBM with its AS400, ICL and DEC.

Micro Computer market was first developed by companies like APPLE COMPUTERS, but a key event was the launch of the IBM PC in August 1981. In the early year of the development of the PC, the Apple Macintosh (technically not a PC) became the standard for graphics - based applications and the IBM PC and a host of IBM-Compatibles, were chosen for text-based (business) applications. However, as chips have become more powerful, the difference in emphasis has become less important. Apple have recently introduced the power PC, which is IBM-Compatible. PCs are now the norm for small to medium-sized business computers. Today microcomputers are Personal Computer system or stand-alone computer. They are being distinguished from other computer systems because of possessing a single microprocessor. Other business computers are:

- File server
- Portables
- Workstations.

FILE SERVER is more powerful than the average desktop PC and it is dedicated to providing additional services for users of network PCs. A very large network is likely to use a 'Mainframe' computer as its server and indeed mainframes are beginning to be referred to as 'enterprise-server'.

PORTABLES: The original portable computers were heavy, weighing around five kilograms and could only be run from the main electricity supply. Subsequent developments allow the true portability.

a) Laptop is powered either from the electricity supply or using a rechargeable battery. It uses 31/2 disks and CD-ROMs, a liquid crystal or gas plasma screen and is fully compatible with desktop PCs.

b) The Notebook is about the size of an A4 pad of paper. Some portables are now marketed as 'sub-notebooks'.

c) The Palm Or Handheld Computer, may or may not be compatible with the PCs. They range from machines, which are little more relatively powerful processors with DOS compatibility and communications features.

WORKSTATION was originally a computer used by one person, particularly for graphics and design applications and was used primarily in engineering. It had a fast and powerful central processor, a high - resolution monitor and large memory. This enabled complex designs to be easily manipulated.

These characteristics however are no longer unique to Workstations. High performance personal computer can offer very similar services, so the distinction is a historical one. Personal computers are generally fitted with some kind of graphics expansion card - a circuit board containing the necessary electronics.

Super Computer is used to process very large amount of data quickly. They are particularly useful for occasions where high volumes of calculations need to be performed. For example in meteorological or astronomical applications, manufacturers of super computers include cray and fujitsu. They are not used commercially.

1.4   **BENEFITS OF COMPUTER TO THE SOCIETY.**

Although data processing either Manual or electronic have the same principle, but the difference can still be explained as follows: -

ACCURACY of information is improved: The computers are generally accurate, whereas humans are prone to error (errors in the input of data). Although there can be software error (error in the programs) and hardware package errors (faults or breakdown in the equipment itself).

The VOLUME of information to be processed is increased. As business grows and becomes more complex, their data processing requirements increase in volume and complexity too. Hence, electronic data processing is always employed to ease the demands on their workforce.
The SPEED at which information becomes available is higher: computers can process data much more quickly than a human. This means that a computer can produce more timely information.
The WORKFORCE is freed up for more skillful and judgement work. Although, "manual" or "human" method of data processing is more suitable when human judgement is involved in the work, computer will still make the required information available when needed as soon as possible.

There is greater ACCESS TO INFORMATION available and more people: The use of databases and the ability to link a number of users via a multi-network improve the distribution and dissemination of information within and beyond an organisation.

1.5 BENEFIT OF PERSONAL COMPUTER TO THE SOCIETY

Personal computer (PCs) also referred to as micro-computers, are particularly beneficial to the society because
- An individual user has direct access for input of data and receipt of output information with the use of desktop computers.
- Individual Computer users can easily develop models or other information systems for their own personal use.
- A manager can make quick decisions about managing cash flows e.g. transferring surplus cash from a current account to an interest-bearing deposit account.

- Computers can improve the ability of managers to develop Models to help with planning and decision making. Decision support system.

- Planning models are valuable management information system tools; Managers can develop budgets, sales forecast and cash flow forecast. They can then carry out intensive sensitivity analysis using the model by asking "what if" questions.

- Terminals linked to a central computer file, or to information of an external organisation give managers access to move information than they would otherwise have comprehensive information which is readily available (in good time) and contributes to an effective management information system.

- Word processing systems include the facility for producing standard letters and mail shots which can be of great assistance to managers(users)

2.0   HARDWARE

Hardware is the various physical components that comprise a computer system, as opposed to the non-tangible software elements. Most of these physical components are physically separated from the peripheral to the main circuitry that does the arithmetical and logical processing but they are the most familiar bits of a computer.

2.1   COMPUTER DEVICES

A computer consists of several interconnected devices or components. They are five basic components, namely, central processing unit, primary storage, secondary storage, input devices, and output devices. This physical equipment that make up a computer is called hardware.

Secondary storage, input and output devices are often called peripheral equipment. The CPU and primary storage contain electronic circuits that store and process data or program instruction. The circuits are formed from place of silicon which is non-metal element. A piece of silicon containing electronic circuits is called an integrated circuit or a chip. The computer chips for the CPU is called processor chips. In microcomputer, the entire CPU contains only one-processor chips and is called microprocessor. In mini computer, mainframe computer or super computer, the CPU may require several processor chips.

Primary storage is composed of many chips for example; a microcomputer may have more than sixteen chips. Each chip is called memory chip and is capable of storing a certain amount of data. The amount of data depends on different types of chips. All the memory chips are made up primary storage (RAM). In microcomputers, the microprocessor and the memory chips are mounted on one board, called the Motherboard or mainboard. The chips in the CPU and primary storage are connected by a set of wires called a bus. Data is sent back and forth between components over the bus.

There are some other chips that are needed to control input/output devices and secondary storage. Some of these chips are built-in Mainboard or are in a separate board. They are called add-on-boards or cards, and are plugged into sockets on the mainboard. These sockets which are called expansion slots are connected to the other components by the bus. The combination of all these chips on or outside motherboard form computer devices. They are enclosed in a computer casing. Other devices such as output devices (Monitor, Printer), Input device (keyboard, Mouse), speakers are plugged into computer devices to form personal computer system.

Note in Microcomputer or stand-alone computer CPU may be regarded as microprocessor. Primary storage may be regarded as Random Access Memory. Secondary Storage may be regarded as Hard disk, Floppy disk or Compact disk.

2.2   CPU – CENTRAL PROCESSING UNIT

The Central Processing Unit s also called Processor. This is the brain or heart of the computer equipment. The CPU carries out the calculations for the program and controls the other components of the system. It does the function by organising circuits into two main units, called Arithmetic logic unit and control unit.

The ALU contains circuits that do arithmetic and perform logical operations. The control unit contains circuits that analysed and execute instructions.

The Arithmetic Logic Unit

The ALU contains arithmetic circuits that can subtract multiply and divide two numbers. More complex operations such as finding the square root of a number are done by sequence of their basic operations. The ALU has logic circuits that can compare two numbers to determine if they are equal or if one number is greater than storage locations called storage registers for storing numbers used in calculations and for storing the results of calculations. To perform a calculation or logical operation, number is transferred from primary storage to storage registers in the ALU. These numbers are sent to the appropriate arithmetic or logic circuit. The results are sent back to the storage registers. The results are transferred from the storage registers to primary storage.

The Control Unit

The control Unit controls the whole computer system by performing the following functions:

- directs and coordinates all operation called for by the program
- activates the appropriate circuits necessary for inputs and output devices.
- Causes the entire computer system to operate in an automatic manner.

The control unit contains a temporary storage location called an instruction register for storing the instruction being executed. It also contains circuits called the instruction decoder – which analyse the instruction register and cause it to be executed. The control unit executes each instruction by following the same basic sequence of steps:

- the next instruction in the program is retrieved for primary storage and stored in the instruction register
- the instruction is sent to the instruction decoder where it is analysed.
- The decoder sends signals to the ALU, primary storage, I/O devices, and secondary storage, that cause the actions required by the instructions to be performed.

These steps are repeated for each instruction in the program until all instructions have been executed.

2.3   **PRIMARY STORAGE**

Primary storage is also called internal storage or memory. It is used to store programs and data currently being processed by CPU. Primary storage circuits like light bulbs need electricity to stay on. If the power to the computer is turned off, all the circuits will turn off and all data in primary storage will be lost. When computer is turned back on the data will not reappear. The data is lost forever. Because of this characteristics primary storage is called volatile storage. This type of primary storage is called RANDOM ACCESS MEMORY or RAM. RAM is the main type of primary storage used with computers and it is volatile.

ROM – Many computers have another type of primary storage called ROM – Read Only Memory. ROM is non-volatile storage. This means that when the power to the computer is turned off, the content of the ROM is not lost. ROM can store preset programs that are always put by computer manufactures. When you turn on a PC, you will usually see a reference on BIOS (Basic Input output System). This is part of the ROM chip containing all the programs needed to control the keyboard, monitor, disk drive and so on.

There are different types of ROM, including PROM EPROM and EEPROM.

PROM – Programmable Read Only Memory – In this type of ROM, data or program can be stored once in PROM but never changed.

EPROM – Erasable Programmable Read Only Memory – In this type of ROM, data or program can be erased by removing the device and exposed it to ultraviolet light.

EEPROM – Electrically Erasable Programmable Read Only Memory – data or program can be completely erased using a special device and new programs or new data can be stored in it.

The Use of Primary Storage (RAM)

Main Memory has several uses:

- Input area – where the data is stored when it is read into CPU, awaiting processing.
- Operating system – controls the operation of the computer.
- Working storage – where calculations are performed and data is stored temporarily.
- Output area where the information is stored prior to output. Both the input and output areas are buffer.
- Application program area – where the user program is held.

The Use of Main Memory (RAM)

Input Area	Operating System	Output Area
	Application area (Program)	
	Working storage area	

2.4 **SECONDARY STORAGE**

Secondary Storage is an optional attachment, which is cable –connected to the CPU. Secondary is nonvolatile. Any data or programs stored in secondary storage stays there, even with the computer power turned off, unless someone purposely erases them. Secondary storage is a permanent from of storage.

Difference between ROM and RAM

ROM	RAM
ROM is nonvolatile	RAM is volatile
ROM is cheaper than RAM	RAM is very expensive
The contents of ROM are always known and can be verified	The contents are not known
ROM can not be updated or corrected	RAM can be updated and corrected
ROM serves as permanent data storage	RAM can serve as temporary data storage

http://www.unaab.edu.ng

Difference between Primary and Secondary Storage

Primary	Secondary
Primary storage/memory is also called Internal or main storage. High speed	Secondary storage or memory is also called External or auxiliary storage. Low speed
It is very expensive	It is not expensive as primary storage
It holds data or programs temporary	It holds data or programs permanently
It holds programs and data in current use in CPU	It holds program or data that will still be used in primary storage
It is faster than secondary	It is not fast as primary
It holds less data	It holds large volume of data or files

 HARD DISKS

* Most PC's have an internal hard disk, but external disks may be used too. External disks sit alongside the computer in an extra 'box' with its own power supplies and plug socket.

* An average PC may have 2Gb (230x 2 bytes = 1073741824 x 2 bytes, i.e 2147483648 bytes). 1 Gb = 230 bytes. The standard size has increased dramatically over recent years as ever more.

* IDE (Integrated Drive Electronics) and Extended IDE (EIDE) are hard disk technologies common on PC's

* More powerful and flexible are SCSI (Small Computer System Interface, pronounced 'SCUZZY') and 'firewire' (1394). The difference between these system lies in the way that data in transmitted between the hard disk and the processor.

* A Zip Drive is a disk drive made by the Iomega Corporation. It is a removable 100-megabyte hard disk for PC's. the drive is suitable for backup, mass storage or for moving files between

computers. The company has recently started to manufacture a larger Jaz drive, which takes 1 Gigabyte disks.

FLOPPY DISKS

* Modern PCs will also have one or two floppy disk drives. The floppy disk provides a cost-effective means of on-line storage for small business computer systems.

* Floppy disk are used in the smallest microcomputer system as well as with minicomputers and are particularly useful in providing a means of decentralized processing.

* A 'floppy' disk can be 3.5" in diameter or 5.25". A 3.5" disk can hold up to 1.44Mb of data.

TAPE STORAGE

- Like an audio or videocassette, data has to be recorded along the length of a computer tape.
- In using tapes, it is not practical to read from and then write on to a single piece of tape at the same time.
- Reading and writing are separate operations, using separate heads, and so two drives are necessary for the two operations.
- Magnetic tape as a file storage medium is only practical when every record on the file will be processed in turn.
- Tape cartridges have a larger capacity than floppy disks and they are still widely used as a backing storage medium.
- They are generally measured in terms of tape width and length for instance, an 8mm tape that is 112m long can store up to 5Gb of data, a 4mm tape of 125m can store up to 12Gb.
- Fast tape, which can be used to create a back-up file very quickly, are known as TAPE STREAMERS. Since tapes can only be updated by producing a completely new carried forward tape this provides an automatic means of data security.

CD -ROM (OPTICAL DISK).

- It uses similar technology to the based laser based compact disc audio system for data storage.

- The capacity of optical disk is very compared with other media and they are more difficult to damage.

- The latest PCs are now automatically with a CD-ROM drive and some software packages are now only available on CD-ROM. CD-ROM stands for Compact Disc Read-Only Memory. This means that data is implanted onto the disc when it is made, and subsequent users can only retrieve information, they cannot alter or overwrite or delete what is already on the disk.

- The speed of CD-ROM drive is relevant to how data can be retrieved; an eight speed drive is quicker than four speed drive. CD recorders are now available for general business use with blank CDs (CD-R). A CD-R can hold up to 650Mb. Once made, CD-ROMs are not reusable in the way that floppy disk are.

- However, a reusable disk (CD-RW) has recently become available.

2.5 INPUT DEVICES

These accept input data/programmes for processing converting if necessary into a form which the computer can understand and operate on. Input is a labour intensive process, typically involving the keying in of data using a keyboard. In many cases, transcription the process of inputting data by keyboard so that it can be converted into the electronic pulses on which the computer circuitry operate is avoided by a process of data capture, where data is recorded in such a way as to be directly convertible into a machine sensible form without any human intervention.

In many situations, data capture or transcription occurs far away from the main computer and data has to be transmitted to where it is to be processed.
Examples of Input device are:

- **The Keyboard**
- The Visual Display Unit (VDU)
- Mouse
- Trackball
- Document Reading Devices

▪ Scanner

2.6   OUTPUT DEVICES

These accept output from the data processing device and convert it into a form suitable for use by the computer's human operators. The commonest methods of computer output are printers and screen display although it is also possible to output onto microfilm or fiche and onto transparencies for overhead projection. Many home computers also produce sound output through speakers.

Examples are:

Printers

The VDU - Visual Display Unit

Graphical User Interface (GUIs)

THE CHOICE OF OUTPUT MEDIUM
The choice of output medium depends on a number of factors

* Is a HARD copy of the output required? If so, what quality?

* The volume of information may affect the choice. It becomes more difficult using VDU when information goes 'off screen' and can only be read a 'page' at a time.

* The speed at which output is required. A large volume of data requires a high-speed printer.

* The stability of the output medium to the application should be considered. A VDU is well suited for interactive processing.

• The cost of acquiring the output device must be worth having them.