COURSE CODE: CMP 111
COURSE TITLE: INTRODUCTION TO COMPUTER
NUMBER OF UNITS: 3 Units
COURSE DURATION: Three hours per week

COURSE LECTURER: **JOHN TEMITOPE OGBITI**

INTENDED LEARNING OUTCOMES

At the completion of this course, students are expected to:

1. Define the concept of Computer
2. History of Computer and generations of computer
3. Understand the characteristics of a computer, classes of computer, types of computer and functions of personal computers
4. Components of a Personal Computer and categories of an operating system
5. Principles of Networking
6. Program development: algorithms and methods of representing algorithms

COURSE DETAILS:

Week 1-2: Introduction to computer History and generations of computers
Week 3-5: the characteristics of a computer, classes of computer, types of computer and functions of personal computers
Week 6-8: Components of a Personal Computer and categories of an operating system
Week 9-10 Principles of Networking: computer network, topology, Internet and Benefits of the Internet
Week 11: Program development: algorithms and methods of representing algorithms concept of algorithms: flowcharts and pseudo code

Week 12 Revision

RESOURCES

• **Lecturer's Office Hours:**
• Mr. John Temitope Ogbiti, Monday 1-2pm,
• **Course lecture Notes: http://www.edouniversity.edu.ng/oer/compsc/cmp111.pdf**
 • **Books:**
• *Introduction to Computer science, A text book for beginners I Informatics by Gilbert Brands.*
• *Introduction to Computer science, by Thomas J. Cashman.*

• **Exams:**
• Final, comprehensive (according to university schedule): ~ 70% of final grade
Assignments & Grading
• **Academic Honesty:** All classwork should be done independently, unless explicitly stated otherwise on the assignment handout.
• You may discuss general solution strategies, but must write up the solutions yourself.
• If you discuss any problem with anyone else, you must write their name at the top of your assignment, labeling them "collaborators".
• **NO LATE HOMEWORKS ACCEPTED**
• Turn in what you have at the time it's due.
• All home works are due at the start of class.
• If you will be away, turn in the homework early.

INTRODUCTION
The computer is fast becoming the universal machine of the twenty-first century. Early computers were large in size and too expensive to be owned by individuals. Thus they were confined to the laboratories and few research institutes. They could only be programmed by computer engineers. The basic applications were confined to undertaking complex calculations   in science and engineering. Today, the computer is no longer confined to the laboratory. Computers, and indeed, computing have become embedded in almost every item we use. Computing is fast becoming ubiquitous. Its application in engineering, communication, space science, aviation, financial institutions, social sciences, humanities, the military, transportation, manufacturing, the extractive industries to mention but a few.
Definitions
Computer is an advanced electronic device that takes raw data as input from the user and processes these data under the control of set of instructions (called program) and gives the result (output) and saves output for the future use. It can process both numerical and non-numerical (arithmetic and

logical) calculations.

A computer has four functions:

a. accepts data	**Input**
b. processes data	**Processing**
c. produces output	**Output**
d. stores results	**Storage**

A diagram to define computer

A Computer System

Brief History of a Computer

A complete history of computing would include a multitude of diverse devices such as the ancient Chinese abacus, the Jacquard loom (1805) and Charles Babbage's "analytical engine" (1834). It would also include a discussion of mechanical, analog and digital computing architectures. As late as the 1960s, mechanical devices, such as the Merchant calculator, still found widespread application in science and engineering. During the early days of electronic computing devices, there was much discussion about the relative merits of analog vs. digital computers. In fact, as late as the 1960s, analog computers were routinely used to solve systems of finite difference equations arising in oil reservoir modeling. In the end, digital computing devices proved to have the power, economics and scalability necessary to deal with large scale computations. Digital computers now dominate the computing world in all areas ranging from the hand calculator to the

supercomputer and are pervasive throughout society. Therefore, this brief sketch of the development of scientific computing is limited to the area of digital, electronic computers.

The evolution of digital computing is often divided into generations. Each generation is characterized by dramatic improvements over the previous generation in the technology used to build computers, the internal organization of computer systems, and programming languages. Although not usually associated with computer generations, there has been a steady improvement in algorithms, including algorithms used in computational science. The following history has been organized using these widely recognized generations as mileposts.

The First Generation (1946 – 1958)
- The first computers used **vacuum tubes** for circuitry and **magnetic drums** for memory, and were often enormous, taking up entire rooms.
- They were very expensive to operate and in addition to using a great deal of electricity, generated a lot of heat, which was often the cause of malfunctions
- First generation computers relied on machine language, the lowest-level programming language understood by computers, to perform operations and they could only solve one problem at a time.
- Input was based on punched cards and paper tape, and output was displayed on printouts

Vacuum tube

The Second Generation (1959 – 1964)

- Transistors replaced vacuum tubes and ushered in the second generation of computers.
- One transistor replaced the equivalent of **40 vacuum tubes**
- Allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable
- Still generated a great deal of heat that can damage the computer.
- Second-generation computers moved from cryptic binary machine language to symbolic, or assembly, languages, which allowed programmers to specify instructions in words
- Second-generation computers still relied on punched cards for input and printouts for output.
- These were also the first computers that stored their instructions in their memory, which moved from a magnetic drum to magnetic core technology

Transistor
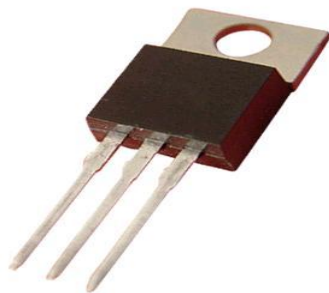
The Third Generation (965 – 1970)

- The development of the **integrated circuit** was the hallmark of the third generation of computers.
- Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers.
- Much smaller and cheaper compare to the second generation computers.
- It could carry out instructions in billionths of a second.
- Users interact with third generation computers through keyboards and monitors and interfaced with an operating system, which allowed the

device to run many different applications at one time with a central program that monitored the memory.

- Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors

Integrated Circuit
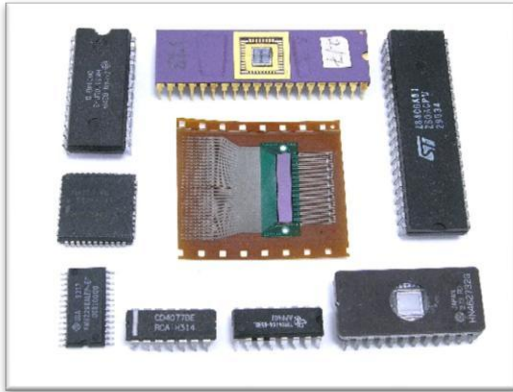
The Fourth Generation (1971 – today)
- The **microprocessor** brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip.
- As these small computers became more powerful, they could be linked together to form networks, which eventually led to the development of the Internet.
- Fourth generation computers also saw the development of GUIs, the mouse and handheld devices.

Microprocessor
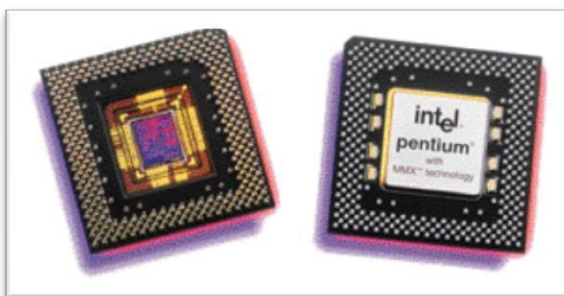
The Fifth Generation (Today to future)
- Based on Artificial Intelligence (AI).
- Still in development.
- The use of parallel processing and superconductors is helping to make artificial intelligence a reality
- The goal is to develop devices that respond to natural language input and are capable of learning and self-organization.

Computer Generations and Their Characteristics

Generation	Characteristics	Examples
First	Used Vacuum tubes Bigger, slower and less efficient Used punch cards Not commercially used	IBM UNIVAC I
Second	Used Transistors Faster and smaller than previous generation Worked with higher level languages	IBM 1620
Third	Used Integrated circuits Flexible and smaller Well suited for commercial applications Known as mini computers	IBM 360 PDP 8 PDP 11
Fourth	Used Very Large Scale Integrated Circuits (VLSI) Interactive general purpose machines Allow rapid application development Easier to use for personal application Can be easily used in network	IBM PC Apple II Super computers such as CRAY series computers
Fifth	Portable and sophisticated Superior in processing speed, user friendliness and Connectivity to network Supports artificial intelligent techniques	IBM notebook Pentium PCs PARAM 10000

CHARACTERISTICS OF A COMPUTER

- **Speed:** The computer can manipulate large data at incredible speed and response time can be very fast.
- **Accuracy:** Its accuracy is very high and its consistency can be relied upon. Errors in computing are mostly due to human rather than technological weakness. There is in-built error detecting schemes in the computer.
- **Storage:** It has both internal and external storage facilities for holding data and instructions. This capacity varies from one machine to the other. Memories are built up in K (Kilo) modules where K=1024 memory locations.
- **Automatic:** Once a program is in the computer's memory, it can run automatically each time it is opened. The individual has little or no instruction to give again.

- **Reliability:** Being a machine, a computer does not suffer human traits of tiredness and lack of concentration. It will perform the last job with the same speed and accuracy as the first job every time even if ten million jobs are involved.
- **Flexibility:** It can perform any type of task once it can be reduced to logical steps. Modern computers can be used to perform a variety of functions like on-line processing, multi-programming, real time processing e.t.c.

CLASSES OF COMPUTER
- **Analog Computers:** This class of computer are special purpose machines that surfaced in the late forties (1948). They are used solving scientific and mathematical equations or problems. An example is the thermal analyzer. Data and figures are represented by physical quantities such as angular positions and voltage.
- **Digital Computers:** They are machines made up of combinations of chips, flip-flops, buttons and other electronic devices to make them function at a very fast speed. A digital computer has its numbers, data letters or other symbols represented in digital format. They are mostly special purpose machines unless minor specifications are included in the design.
- A computer that combines the features of a digital and analog computer is called a ***hybrid computer***.

TYPES OF COMPUTER
Super Computers
- A super computer is the most powerful computer available at any given time. These machines are built to process huge amounts of information and do so very quickly.
- Supercomputers are built specifically for researchers or scientists working on projects that demand very huge amounts of data variables; an example is in nuclear research, where scientists want to know exactly what will happen during every millisecond of a nuclear chain reaction. (To demonstrate the capability of super computers, for an air pollution control project that involves more than 500,000 variables, it will take a mini

computer about 45 hours to complete the simulation process while it will take a super computer 30 minutes only).

- They are big in size, generate a lot of heat and are very expensive. (Super computers are made by CRAY Company).

Mainframe Computers

- The largest types of computers in common use are the mainframe computers. They are designed to handle tremendous amounts of input, output and storage.
- They are used mainly by large organization like the PHCN, NITEL, and CBN.
- Other users access mainframe computers through terminals. Terminals consist of a type of keyboard and a video display i.e. monitors. The mainframe is usually in the computer room (Mainframe computers are made by IBM, Boroughs & Univac).

Mini Computers

- These are physically small compared to mainframes and are generally used for special purposes or small-scale general purposes.
- The best way to explain the capabilities of mini computers is to say they lie between mainframes and personal computers. Like mainframes, they can handle a great deal more input and output than personal computers.
- Although some minicomputers are designed for a single user, many can handle dozens or even hundreds of terminals.
- Advances in circuitry means modern mini computers can out-perform older mainframes of the 60s. (Examples are Digital Equipment Company's PDP II and Vax rang)

Workstations

- Between mini computers and micro computers – in terms of processing power is a class of computers known as workstations.
- A workstation looks like a personal computer and is typically used by one person, although it is still more powerful than the average personal computer.
- The differences in the capabilities of these types of machines are growing smaller. They significantly differ from micro computers in two ways: the

central processing unit (CPU) of workstations are designed differently to enable faster processing of instructions and most of the micro computers can run any of the four major operating systems.

- Workstations [(Reduced Instruction Set Computing (RISC)] use UNIX operating system or a variation of it. (A note of caution: Many people use the term workstation to refer to any computer or terminal that is connected to another computer. Although this usage was once a common meaning of the term, it has become out dated) (The biggest manufacturers of workstations are Sun Microsystems).

Micro Computers/Personal Computers
- The term microcomputers and personal computers are used interchangeably to mean the small free- standing computers that are commonly found in offices, homes and classrooms.
- Many micro computers are built specially to be used in watches, clocks, and cameras. Today, PCs are seriously challenging mainframes and mini computers in many areas. In fact today PCs are more powerful than mainframes of just a few years ago, and competition is producing smaller, faster models every year.

TYPES OF PERSONAL COMPUTERS
- THE DESKTOP: This is the first type of PCs and the most common. Most desktops are small enough to fit on a desk, but are a little too big to carry around.
- THE LAPTOP: They weigh about 10pounds (4.5kg). They are battery – operated computers with built–in screens. They are designed to be carried and used in locations without electricity. Laptops typically have an almost full –sized keyboard.
- THE NOTEBOOK: They are similar to laptops and PCs, but smaller. They weigh about 6 to7 pounds (2.7 – 3.2kg). As the name implies, they are approximately the size of a notebook and can easily fit inside a brief case.
- THE PALMTOP: They are also known as personal digital assistance (PDAs) and are the smallest of portable computers. Palmtops are much less powerful than notebooks or desktops models and feature built-in

applications such as word processing. They are mostly used to display important telephone numbers and addresses.

FUNCTIONS OF PERSONAL COMPUTERS
Personal computers can do a lot of things. The most common tasks computers perform include:
- Writing documents such as memos, letters, reports and briefs
- Budgeting and performing accounting tasks
- Analyzing numeric information
- Searching through lists or reports for specific information
- Scheduling and planning projects.
- Creating illustrations
- Communicating by using electronic mail
- Advertising products and services.

COMPONENTS OF A PERSONAL COMPUTER
A personal computer is not a single unit. A typical computer consists of several basic parts or components that work together. To perform any computer task you need two major components: the hardware and the software.

[1] The *hardware* is the physical components of a computer system. Generally you can think of the hardware as any part of the computer that you can see or touch. Although the hardware of a computer is capable of performing marvelous tasks, it cannot accomplish any of them without the vital instructions that the software provides.

[2] The *software* is a set of instructions that tells the hardware what to do. You can't see or touch the software, although you can see packages that contain the software. It is typically distributed on CD-ROM disc and is installed on the computer hard drive.

HARDWARE COMPOINENTS
The major hardware components of the personal computer consist of the following:

[1] *Input Devices*: Input devices are the computer hardware that accepts data and instructions from a user. Input devices have been built in many forms to help in communicating with the computer. The most common input devices are the keyboard and the mouse.

i. **The Keyboard*:*** The keyboard of the personal computer comes in a number of styles. The various models may differ in size and shape, but except for a few special purpose keys, MDS keyboards are laid out almost identifiably. The most common keyboard used today was established by IBM. The computer keyboard is more than just a typewriter. It contains all of the keys required for typing letters, numbers, plus the keys for entering commands and moving around on the screen. There are 101 keys arranged in groups: Alphanumeric, Numeric, Function and Arrow/Cursor movement keys, and Computer keys.

ii. **A mouse** is a pointing device that enables you to quickly move around on the screen, and to select commands from menus rather than type the commands. A mouse is useful because it enables the user to point at items on the screen and clicks a button to select the item. It is convenient for entering certain data.

iii. **Track Balls:** A trackball is an input device that works like an upside-down mouse. You rest your hand on the exposed ball and the fingers on the button. To move the cursor around the screen, you roll the ball with your thumb. Trackballs are much popular with notebook computers. They require less desk space than the mouse.

iv. **The Joystick*:*** This is a pointing device commonly used for games. It is not used for business applications.

v. **The Pen*:*** It is an input device that allows a user to write on or point at a special pad on the screen of a pen-based computer, such as a personal digital assistant (PDAS).

vi. **The Touch Screen:** A computer screen that accepts input directly into the monitor; users touch electronic buttons displayed on the screen. It is appropriate in environment where dirt or weather would render keyboards and pointing devices useless.

vii. **The Scanner*:*** This is an input device used to copy images into a computer memory without manual keying. It works by converting any image into electronic form by shinning light on the image and sensing the intensity of reflection at every point. There are several kinds of scanners. These includes: hand held, flatbed, and sheet-feds.

viii. **The Bar-Code Reader:** This is one of the most commonly used input devices after the keyboard and mouse. It is commonly found in supermarkets and department stores. This device converts a pattern of printed bars on products into a product number by emitting a beam of light frequently from a laser that reflects off the bar code image. A light sensitive detector identifies the bar-code image by special bars at both ends of the image. Once it has identified the barcode, it converts the individual bar patterns into numeric digits.

Input Devices

1. Mouse		2. Keyboard	
3. Scanner		4. Digital Camera	
5. Web Camera		6. Joysticks	
7. Track Ball		8. Touch Pad/ Screen	
9. Light Pen		10. Bar Code Reader	
11. Microphone		12. Graphics Tablets	

[2]*Processing Devices:* Basically two components handle processing in a computer: the central processing unit (CPU) and the memory.

a. **The Central Processing Unit (CPU)**: The central processing unit (CPU) is a tiny electronic chip known as the micro processor located in the system unit. It is installed on the main circuit board of the computer, the motherboard. The CPU as the name implies is where information is processed within the computer. In this regard, you might think of the CPU (processor) as the brain of the computer. The CPU is otherwise known as microprocessor. Every CPU has at least two basic parts. The control unit and the Arithmetic Logic Unit (ALU). The control unit coordinates all the computer activities and contains the CPUs instruction to carry out commands. The ALU is responsible for carrying out arithmetic and logic functions. In other words, when the control unit encounters an instruction that involves arithmetic and logic it refers it to the ALU.

b. **Memory:** What happens to all the information we put into the computer: before, while and after information is processed? It is held in the computer memory or Random Access Memory (RAM). The memory to which we are referring here is not the kind of long-term storage that allows you to save work on a floppy disk and months later to use it, but rather a short term holding area that is built into the computer hardware. While the CPU is fast and efficient, it cannot remember anything by itself. It often refers to the memory in the computer for software instruction and to remember what it is working on. The term RAM and memory are often interchangeable. RAM refers to the way the CPU searches through memory for the information it needs. For the workings of a memory, information is stored in memory chips. The CPU can get information faster from RAM than it can from a disk. A computer then reads information or instruction from disks and stores the information in the RAM where it can get the information quickly. The CPU processes the information and then returns to the RAM.

Central Processing Unit (CPU   *Memory*

[3] *Storage Devices:* Among the most important part of a computer system are the devices that allow you to save data or information. The physical components or materials on which data are stored are called storage media. A storage device is a piece of hardware that permanently stores information. Unlike electronic memory, a storage device retains information when electric power is turned off. There are several storage devices and primary among them are:

a. **The Floppy Disk:** The floppy disk is a circular flat piece of plastic made of a flexible (or floppy) magnetic material on which data are recorded. Floppy disk drives store data on both sides of the disks. Earlier computers stored data on only a single side of the floppy disk.

b. **The Hard Disk:** The hard disk is generally not visible because hard disks are usually enclosed within the system unit. The hard disk is a stack of metal platters that spin on one spindle like a stack of rigid floppy disks. Unlike floppy disks where the disk and drive are separate, the hard-disk drive, or hard drive is the whole unit. Generally you cannot remove the hard disk from its drive; however some manufacturers make removable hard disks that plug into a separate drive unit.

c. The CD-ROM: CD-ROM disks are hard, plastic, silver – a colored disk. CD-ROM is an acronym for Compact Disc Read – Only Memory. This implies that the disk can only be read. You cannot change or overwrite the contents of a CD-ROM disk.

d. **Tape Drives:** A tape drive is a device that reads and writes data to the surface of a magnetic tape, generally used for backing up or restoring the data of an entire hard disk.

e. **The Zip Drive:** Zip drives are an alternative to tape backup units or tape drives. A zip drive can be internal or external. Zip drives have

removable cartridges or disk. A zip drive holds about 100MB to 250 MB of Data.

Storage Devices

B. Optical disk		C. Pen Drive	
D. Zip Disk (super disk)		E. Floppy Disk	
F. Memory Cards		G. External Hard Disk	

[4] *Output Devices:* Output devices return processed data, that is, information back to the user. In other words, output devices allow the computer 'talk' to us. The most common output devices are the monitor and the printer. Others include modems and speakers.

    a. **The Monitor:** The monitor is an output device that enables the computer to display to the user what is going on. It has a screen like that of a television. It is commonly referred to as the screen or display. It is the main source for output of information from the computer. As data is entered through an input device, the monitor changes to show the effects of the command. Messages displayed on the screen allow the user to know if the command is correct.

    b. **The Printer**: The printer is an output device that produces on hard copy or a print out on a paper i.e. it takes data from its electronic form and prints it out on paper. There are three principal types of printers; Laser, Inkjet and Dot – Matrix.

c. **The Sound Card:** Sound Cards, otherwise known as sound boards, is a hard ware board. It is a device that produces audio sounds and usually provides ports in the back of a computer for external speakers. It is installed in one of the expansion slot inside the system unit's motherboard.

d. **The Modem:** The modem is a device that allows a computer to communicate with another computer through a telephone line. Both computers need compatible modem. With a modem, a computer and required software, you can connect with other computers all over the world.

Output Devices

1. Monitor		2. Printer (Dot Matrix)	
3. Projector		InkJet	
4. Plotter		Laser	
5. Speaker			

SOFTWARE COMPOINENTS

Software is a set of instructions that operate a computer, manipulate the data and execute particular functions or tasks. In other words, it is a programs, routines, and symbolic languages that control the function of the hardware.

For software (the instructions) to perform various functions, it must be programmed. That is, the instructions need to be written in a programming language that the computer can understand. Without a program, a computer is useless.

Computer program is a sequence of instructions that can be executed by a computer to carry out a process.

There are two kinds of software, systems software and applications software.

[1] **Applications Software:** Applications software includes programs that user access to carry out work. They include applications for the following functions.

- ✓ Word processing is the most common applications software. The great advantage of word processing over using a typewriter is that you can make changes without retyping the entire document. Word processors make it easy to manipulate and format documents. Example of word processing software is Microsoft Office Word, Microsoft Works Word, Open Office Word, etc.

- ✓ Spreadsheets are computer programs that let people electronically create and manipulate spreadsheets (tables of values arranged in rows and columns with predefined relationships to each other). Spreadsheets are used for mathematical calculations such as accounts, budgets, statistics and so on. Example; Microsoft Excel, Lotus 1, 2, 3, and SPSS.

- ✓ Database management applications are computer programs that let people create and manipulate data in a database. A database is a collection of related information that can be manipulated and used to sort information, conduct statistical analyses or generate reports. Example is Microsoft Access, Microsoft SQL, MySQL and Oracle database.

- ✓ Presentation packages and graphics are computer programs that enable users to create highly stylized images for slide presentations and reports. They can also be used to produce various types of charts and graphs. Many software applications include graphics components including: paint programs, desktop publishing applications and so on. Example is Microsoft PowerPoint.

- ✓ Communications applications typically include software to enable people to send faxes and emails and dial into other computers.

[2] **Systems Software**: includes the operating system and all the utilities that enable the computer to function. The most important program that runs on a computer is the operating system. Every general-purpose computer

must have an operating system in order to run other programs. This includes controlling functions such as the coordination of the hardware and applications software, allocating storage facilities, controlling the input and output devices and managing time sharing for linked or networked computers.

FUNCTIONS OF AN OPERATING SYSTEM

- **Booting of Computer:** This is the first process which takes place the moment the computer's electrical switch is put on. During this process all the peripherals connected to the computer are checked and validated; at the end of the validation process, the OS signals the user to begin working on the computer.
- **Providing User Interface:** The OS provides an interface for the user, either as a command line interface or as a graphical user interface. This enables the user to communicate with the computer.
- **Managing the Hardware:** OS controls and manages hardware resources. For example, OS manages the selection and operation of devices used for input, output and storage. In other words the OS serves as the intermediary between programs and hardware.
- **Managing the File System:** The operating system groups' data together into -logical compartments for storage on disk. These groups of data are called files. The computer stores information in files. Files may contain program instructions or data created or used by a program. The OS maintains the list of files on a disk.
- **Supporting Programs:** Another major function of an OS is to provide services to other programs. Often these services are similar to those that the OS provides directly to users. For example when you want your word- processing program to retrieve a document, the word processor will list the files in the directory that you specify.
- **Some of the other services** that an OS provides to programs are:
  - ✓ saving files to disk reading them from disk into memory
  - ✓ checking available disk or memory space
  - ✓ allocating memory to hold data for a program

CATEGORIES OF AN OPERATING SYSTEM

1. **Multitasking the Operating System/Multi Programming:** This is an OS that is able to run more than one program task per operation time.

There are two types of multitasking operating systems cooperative and preemptive.

- **Cooperative Multitasking:** This requires cooperation between the OS and application programs. In this case the programs are written in such a way that they periodically check with the OS to see whether any other program needs the CPU. If a program needs the CPU, they relinquish control of the CPU to the next program. Cooperative multitasking is common with Macintosh OS and DOS computers running Microsoft Windows.

- **Preemptive Multitasking:** Under this scheme, the OS maintain a list of processes (programs) that are running. Each process on the list is assigned a priority by the OS when it is started. At any time, the OS can intervene and modify the priority list. The OS also retains control of the amount of time that it spends with any process before going to the next process. UNIX, OS/2 and Windows NT employ preemptive multitasking.

2. **Multi-user Operating Systems:** A multi-user OS allows more than a single user access to a computer at the same time. Of course, to accomplish this, a multi-user OS must also be capable of multitasking. Only UNIX OS and Windows NT are capable of supporting multiple users. UNIX provides three ways to let people use the same PC at the same time.

- The first way to connect to a PC running UNIX is from another computer with a modem. The remote user can log in and run programs, list files, send e-mails read the news and otherwise do everything they could do if they were physically in front of the UNIX computer.

- The second way to connect to a UNIX computer is by attaching terminals to the PC. Terminals are inexpensive devices that consist of a keyboard, and a monitor.

- The third way to tap into a UNIX computer multi-user capabilities is with a network.

3. **Multiprocessing Operating Systems:** A special type of OS is required to use a computer equipped with more than one CPU. In other words, multiprocessing requires an OS capable of using and managing a series of CPUs. There are two types:

- With asymmetrical multiprocessing one main CPU retains the overall control of the computer as well as that of the other microprocessor.
- On the other hand in symmetrical multiprocessing there is no single controlling CPU. This arrangement provides a linear increase in system capacity for each processor added to the system.
- Some extensions of UNIX supports asymmetric multiprocessing while Windows NT supports symmetric multiprocessing.

TYPES OF OPERATING SYSTEMS

1. **DOS (Disk Operating System):** MS-DOS used to be the most common and most popular of all the PC operating systems. The reason for its popularity then is because of the overwhelming volume of available software and large installation of Intel-based PCs. DOS runs on any of the Intel microprocessor. DOS functions through the command–line interface i.e. DOS functions by commands.

2. **Microsoft Windows:** Microsoft Windows is a version of DOS. It was released in 1987. Microsoft Windows can run standard DOS programs either in a window within the Graphic Use Interface (GUI) or on a full-screen. To take full advantage of the Microsoft environment you need programs written for Microsoft Windows.

3. **Operating Systems 2 (OS/2):** 1BM and Microsoft teamed up to develop the Operating System 2(OS/2) to take full advantage of the multitasking capabilities of the newly introduced Intel 80286 microprocessor. OS/2 like DOS has a character–based command-line mode, but unlike DOS, the command interpreter is a separate program from the OS kernel and is only involved when you click on the OS/2. OS/2 runs only on Intel 80286 and later Intel processors.

4. **The Macintosh OS:** The Macintosh OS is a purely graphic machine. In fact there is no equipment of a command-line interface available for it. Its tight integration of OS, GUI and desktop make it desirable for people who do not want to deal with a command-line interface. The Macintosh OS only runs on Macintosh machine. The Macintosh OS has an additional network protocol built into it and is ideal for desktop publishing. Installing and configuring a Macintosh with new hardware device is simple.

5. **UNIX:** UNIX is the first OS that runs on many different types of computers. It runs on Cray supercomputers, PCs, and everything in between including

mainframes and minicomputers. UNIX is older than all the other PC operating systems and in many ways served as a model for them. UNIX is based on a simple idea-small is better. Every command and program that makes up the OS is designed to do a simple very specific task and do it well. UNIX is an extremely robust and capable OS that utilizes command –line and there are so many commands.

6. **Microsoft Windows NT:** Microsoft Windows NT is a new OS designed from scratch for the most modern and capable machines available. Microsoft Windows NT offers built-in features that no other PC OS has – with the possible exception of UNIX. In addition to the traditional UNIX features of strict system security, built-in networking, built-in communications and electronic mail services development and system administration tools, and a GUI. Microsoft Windows NT can run Microsoft Windows applications and many UNIX applications, directly. Like OS/2 it is a 32-bit OS that can use 386, 486 and Pentium processors Microsoft Windows NT is multitasking and purely graphical OS with network software to make a network client or server. It is single- user and allows access to command line interface of the DOS unlike the Macintosh.

PROGRAM DEVELOPMENT

We said earlier that software is a program that tells the computer what to do and how to do it. This implies that without the software computer will practically do nothing and you will not be able to use it at all. This software cannot be seen like we see the hardware. They are *programs*.

Programs are coded set of instructions that instruct the computer to perform specific task. In other word, it tells/instructs the computer what the user intend to do. So to communicate with the computer we would need software, before we can have software we would need to write a program. To write a good program we need to develop algorithm and a flowchart. So, what are they?

ALGORITHM /PSEUDO-CODE

Algorithm: An algorithm is a set of steps for solving a particular problem. To be an algorithm, a set of rules must be unambiguous and have a clear stopping point". There may be more than one way to solve a problem, so there may be more than one algorithm for a given problem.

Pseudo-code: A pseudo-code is an algorithm but in this case it uses a mixture of English statements, some mathematical notations, and selected keywords from a programming language. Most at time when we say algorithm in computer science we mean **pseudo-code**.

Before writing an algorithm/pseudo-code for a problem, one should find out what is/are the inputs to the algorithm and what is/are expected output after running the algorithm. Now let us take some exercises to develop an algorithm for some simple problems: While writing algorithms we will use following symbol for different operations:

'+' for Addition

'-' for Subtraction

'*' for Multiplication

'/' for Division and

' ' for assignment. For example A =X*3 means A will have a value of X*3.

SAMPLES OF ALGORITHM AND PSEUDOCODE

PSEUDO-CODE	ALGORITHM
START 1. INPUT A 2. INPUT B 3. Sum A + B 4. PRINT Sum **END OF ALGORITHM**	**BEGIN:** *First, accept the first number* *Second, accept the second number* *Add the first and second number together* *Print the result* **END OF ALGORITHM**

CHARACTERISTICS OF AN ALGORITHM

- Each step of an algorithm must be exact. This goes without saying. An algorithm must be precisely and unambiguously described, so that there remains no uncertainty. An instruction that says "shuffle the deck of card" may make sense to some of us, but the machine will not have a clue on how to execute it, unless the detail steps are described. An instruction that says "lift the restriction" will cause much puzzlement even to the human readers.

- An algorithm must terminate. The ultimate purpose of an algorithm is to solve a problem. If the program does not stop when executed, we will not be able to get any result from it. Therefore, an algorithm must contain a finite number of steps in its execution. Note that an algorithm that merely contains a finite number of steps may not terminate during execution, due to the presence of 'infinite loop'.

- An algorithm must be effective: An algorithm must provide the correct answer to the problem.

- An algorithm must be general: An algorithm must solve every instance of the problem. For example a program that computes the area of a rectangle should work on all possible dimensions of the rectangle.

FLOWCHART

A flowchart is a graphical or pictorial representation use to solve a giving problem. To be more precise, it is a graphical representation of algorithm. It shows sequence of operations and procedures to be taken to solve the problem. This means by seeing a flow chart one can know the operations performed and the sequence of these operations in a system. Algorithms are nothing but sequence of steps for solving problems. So a flow chart can be used for representing an algorithm. A flowchart, will describe the operations (and in what sequence) are required to solve a given problem. You can see a flow chart as a blueprint of a design you have made for solving a problem.

For example suppose you are going for a picnic with your friends then you plan for the activities you will do there. If you have a plan of activities then you know clearly when you will do what activity. Similarly when you have a problem to solve using computer or in other word you need to write a computer program for a problem then it will be good to draw a flowchart prior to writing a computer program. Flowchart is drawn according to defined rules.

Information system flowcharts show how data flows from source documents through the computer to final distribution to users.
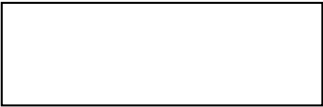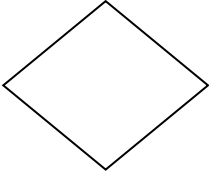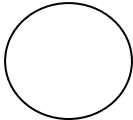
Program flowcharts show the sequence of instructions in a single program or subroutine. Different symbols are used to draw each type of flowchart.
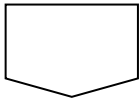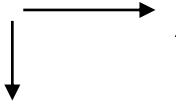
A Flowchart does the following:

- ✓ shows logic of an algorithm
- ✓ emphasizes individual steps and their interconnections e.g. control flow from one action to the next

FLOWCHART SYMBOLS

The basic flowchart symbols are as follows:

SYMBOL	NAME	FUNCTION
	Input/output	Use for any input/output operation
	Process	Indicate any type of operation done in the CPU or memory
	Decision	Use to ask a question that can be answered in a binary format (Yes/No, True/False
	On-page connector	Provide connection of program flow within the same page

	Off-page connector	Provide connection of program flow within different pages
	Flow lines	Shows direction of flow

EXAMPLES OF ALGORITHMS AND FLOWCHARTS

Problem 1: Find the area of a Circle of radius r.
Inputs to the algorithm:
Radius r of the Circle.

Expected output:
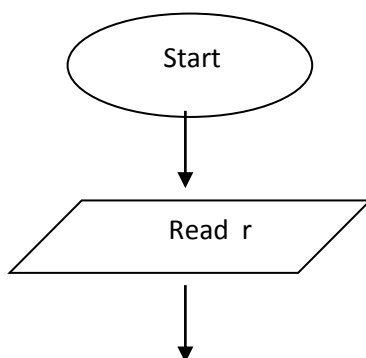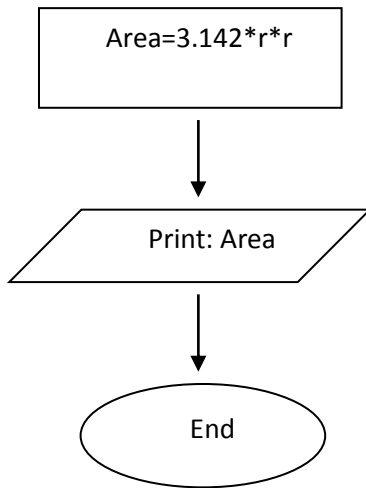Area of the Circle

Algorithm:

Step1: Start
Step2: Read\input the Radius r of the Circle
Step3: Area PI*r*r // calculation of area
Step4: Print Area
Step5: End

Problem2: Write an algorithm to read two numbers and find their sum.
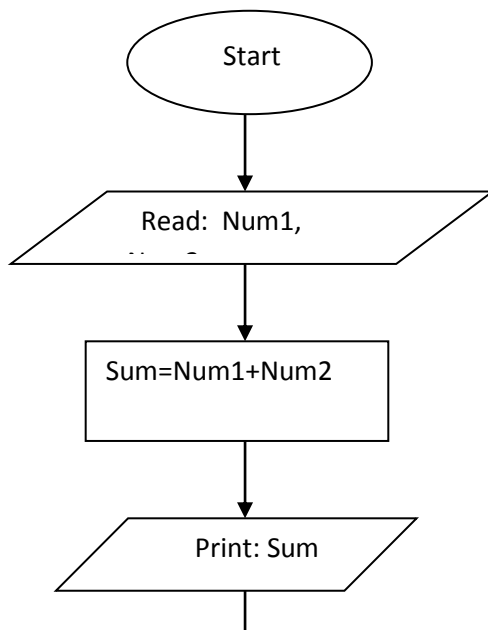
Inputs to the algorithm:
num1.
num2.

Expected output:
Sum of the two numbers.

Algorithm:

Step1: Start
Step2: Read\input: num1.
Step3: Read\input: num2.
Step4: Sum =num1+num2 // calculation of sum
Step5: Print: Sum
Step6: End

Problem 3: Convert temperature Fahrenheit to Celsius

Inputs to the algorithm:
Temperature in Fahrenheit
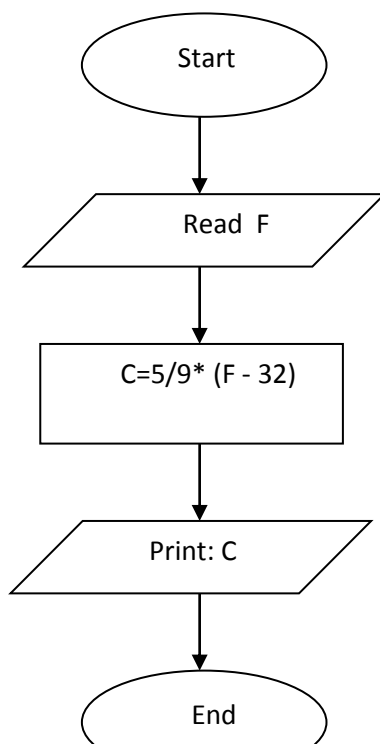
Expected output:
Temperature in Celsius

Algorithm:

Step1: Start
Step 2: Read Temperature in Fahrenheit F
Step 3: C 5/9*(F32)
Step 4: Print Temperature in Celsius: C
Step5: End

```
        ┌─────────┐
        │  Start  │
        └────┬────┘
             │
             ▼
       ╱─────────────╲
      ╱    Read  F    ╲
      ╲───────────────╱
             │
             ▼
      ┌────────────────┐
      │ C=5/9* (F - 32)│
      └────────┬───────┘
               │
               ▼
       ╱─────────────╲
      ╱   Print: C    ╲
      ╲───────────────╱
             │
             ▼
        ┌─────────┐
        │   End   │
        └─────────┘
```

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TYPES OF LOGIC (CONTROL STRUCTURES) USED

In the late 1960s, two mathematicians, Carrado Boehm and Giuseppe Jocopini, proved that even the most complex logic can be expressed using the three general types of logic or control structures: **Sequential** (Begin – End), **Selection** (If-Then-Else) and **Iteration** (Do-While or Do-Until). Naturally, these general types of logic or control structures can be combined in any fashion or combination to produce a process which when executed will yield the desired result.

SEQUENTIAL (BEGIN – END)

The sequence is exemplified by sequence of statements place one after the other - the one above or before another gets executed first. In flowcharts, sequence of statements is usually contained in the rectangular process box.

SELECTION/ BRANCHING (IF-THEN-ELSE)

The branch refers to a binary decision based on some condition. If the condition is true, one of the two branches is explored; if the condition is false, the other alternative is taken. This is usually represented by the 'if-then' construct in pseudo-codes and programs. In flowcharts, this is represented by the diamond-shaped decision box. This structure is also known as the selection structure.

ITERATIVE/LOOP

The loop allows a statement or a sequence of statements to be repeatedly executed based on some loop condition. It is represented by the 'while' and 'for' constructs in most programming languages, for unbounded loops and bounded loops respectively. (Unbounded loops refer to those whose number of iterations depends on the eventuality that the termination condition is satisfied; bounded loops refer to those whose number of iterations is known before-hand.) In the flowcharts, a back arrow hints the presence of a loop. A trip around the loop is known as iteration. You must ensure that the condition for the termination of the looping must be satisfied after some finite number of iterations, otherwise it ends up as an infinite loop, a common mistake made by inexperienced programmers. The loop is also known as the repetition structure.

The three basic control structures can be represented pictorially as shown below:

| Sequential | Selection | Iteration |
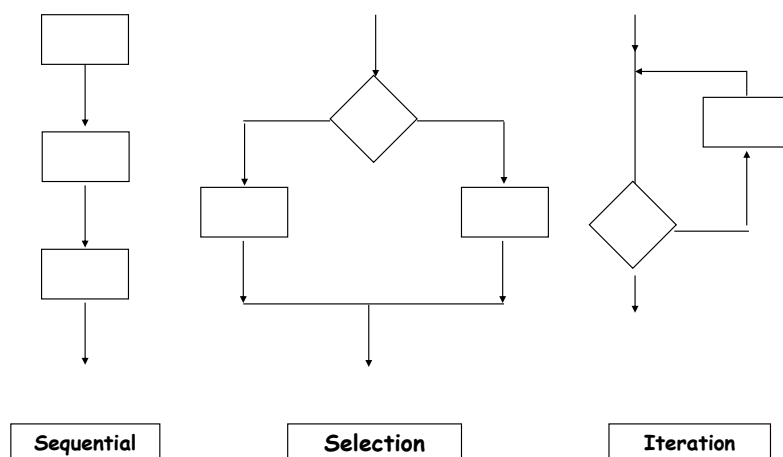
PRINCIPLES OF NETWORKING

Computer Networks

Networks are systems that are formed by links. For example, roads that connect groups of people together create a physical network. Connections with your friends create your personal network. Websites that allow individuals to link to each other's pages are called social networking sites.

People use the following networks every day:

- Mail delivery system
- Telephone system
- Public transportation system
- Corporate computer network
- The Internet

Networks share information and use various methods to direct the manner in which information flows. The information on the network goes from one place to another, sometimes via different paths, to arrive at the appropriate destination. For example, the public transportation system is a network similar to a computer network. The cars, trucks, and other vehicles are like the messages that travel within the network. Each driver defines a starting point (source computer) and an ending point (destination computer). Within this system, there are rules such as stop signs and traffic lights that control the flow from the source to the destination. A computer network also uses rules to control the flow of data between hosts on a network.

A host is any device that sends and receives information on the network. Some devices can serve either as hosts or peripherals. For example, a printer connected to your laptop that is on a network is acting as a peripheral. If the printer is connected directly to a network, it is acting as a host.

Many different types of devices can connect to a network:

- Desktop computers
- Laptop computers
- Tablet computers
- Smartphones
- Printers
- File and print servers
- Game consoles

- Home appliances

Computer networks are used globally in businesses, homes, schools, and government agencies. Many of the networks are connected to each other through the Internet. A network can share many different types of resources and data:

- Services, such as printing or scanning
- Storage space on removable devices, such as hard drives or optical drives
- Applications, such as databases
- Information, stored on other computers
- Documents
- Calendars, synchronizing between a computer and a smartphone

Data Networks Share Many Types of Data

LOGICAL TOPOLOGIES

A logical topology describes how the hosts access the medium and communicate on the network. The two most common types of logical topologies are broadcast and token passing. In a broadcast topology, a host broadcasts a message to all hosts on the same network segment. There is no order that hosts must follow to transmit data. Messages are sent on a First In, First Out (FIFO) basis.

Token passing controls network access by passing an electronic token sequentially to each host. If a host wants to transmit data, the host adds the data and a destination address to the token, which is a specially-formatted frame. The

token then travels to another host with the destination address. The destination host takes the data out of the frame. If a host has no data to send, the token is passed to another host.

PHYSICAL TOPOLOGIES

A physical topology defines the way in which computers, printers, and other devices are connected to a network. The figure provides six physical topologies.
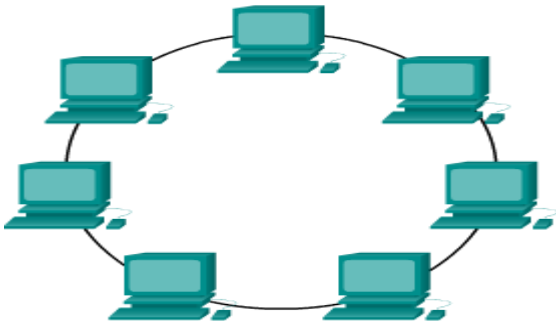
Bus Topology

In a bus topology, each computer connects to a common cable. The cable connects one computer to the next, like a bus line going through a city. The cable has a small cap installed at the end called a terminator. The terminator prevents signals from bouncing back and causing network errors.
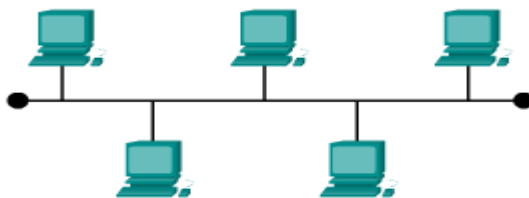

Ring Topology

In a ring topology, hosts are connected in a physical ring or circle. Because the ring topology has no beginning or end, the cable is not terminated. A token travels around the ring stopping at each host. If a host wants to transmit data, the host adds the data and the destination address to the token. The token continues around the ring until it stops at the host with the destination address. The destination host takes the data out of the token.

Star Topology

The star topology has a central connection point, which is normally a device such as a hub, switch, or router. Each host on a network has a cable segment that attaches the host directly to the central connection point. The advantage of a star topology is that it is easy to troubleshoot. Each host is connected to the central device with its own wire. If there is a problem with that cable, only that host is affected. The rest of the network remains operational.
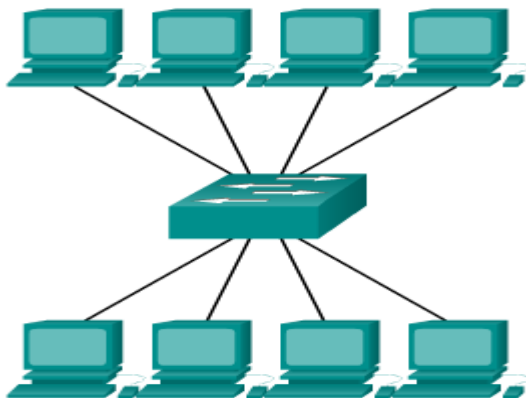
Mesh Topology

The mesh topology connects all devices to each other. When every device is connected to every other device, a failure of any cable or device along a connection does not affect the network. The mesh topology is used in WANs that interconnect LANs.
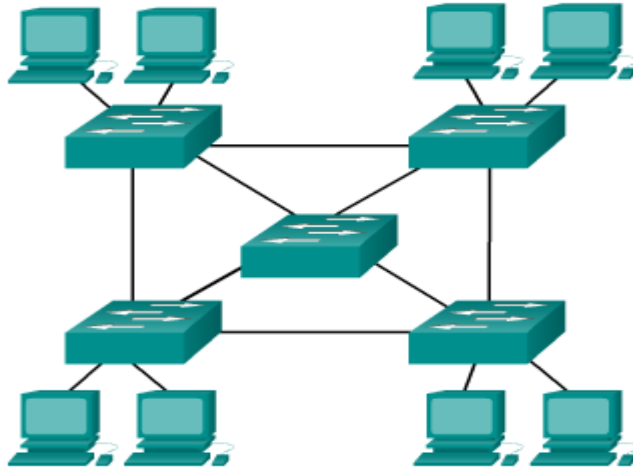
INTERNET

The Internet commonly referred to as the 'Net' is better described than defined, as a global network of computers. It is often described as a network of networks because it first began through the linking of the existing local computer networks used by universities and governmental organizations. The Internet is a constellation of computers around the world that speak the same language so information travels seamlessly from one computer to another. Globally, the Internet connects scientific research, educational, government, commercial and business networks. When you connect to the Internet, your computer becomes part of the global network of computers. The Internet is more than a technological marvel. The peace is quick, with messages and information racing round the world in a few seconds. It has ushered in an era of sweeping changes in networking and communication that has left no business, agency, organization or government untouched.

How the Internet Developed

The Internet began in the 1960s when the US Department of Defense through ARPANET (Advanced Research Project Agency Network) began creating a

computer network that would continue to function in the event of a major disaster. In 1969, four mainframe computers at a U.S. university were linked into a network that transferred data on dedicated high-speed transmission lines. Through the 1970s and 1980s new similar networks were created to link educational institutions, government offices and military centers in the United States and other countries. In the 1990s, as the Internet grew, private businesses and other regional network providers took over the operation of the major Internet networks and the development of much of the information available online. Private businesses, educational institutions, organizations and individuals now develop much of the information content available online.

How Information is transmitted on the Internet

The Internet is a worldwide complex of small regional networks. To understand this, picture a major road connecting large cities. Smaller roads link the cities to small towns where residents travel on narrow residential streets. The high-speed Internet is the major road in this scenario. Connected to it are smaller computer networks (functioning like smaller, less traveled roads) that can share data information at high speeds. In order to enable different computers to communicate and transmit packaged information with each other, a standard 'protocol' has been established for transporting data. This Internet protocol is called Transmission Control Protocol/Internet Protocol (TCP/IP) and allows all networks all over the world to communicate with each other on the Internet.

When transmitting information over a network or the Internet, it is in the same binary form as when it is stored on a computer, but the data has to be packaged for transmission. This procedure is necessary because bits travelling freely on the network will have no meaning to network devices. So before data is transmitted on the Internet, network software forms the data into packets.

Benefits of the Internet

Basically and generally, the benefits derivable from the utilization of the Internet are mainly as follows:

- Speed/Time Saving: The speed of transmission on the Internet is the significant benefit of the Internet. A letter or document that could take days to arrive by regular mail can be sent to the other side of the world in minutes. Likewise, searching through a card catalogue at a library can be

a time consuming, tedious process, but you can search an online version of the same catalogue in a fraction of the time. The speed of transmitting information naturally saves time and money.

- Breadth/Reach: The Internet gives you access to a vast (and growing) collection of databases, documents, computer software; these and almost any other kind of information can be stored electronically.

- Cost Saving: Exchanging information via the Internet is less expensive than using telephones or fax machines especially where telephone access fees are high. Likewise marketing and advertising your products and services on the Internet can be less expensive than using conventional printing and document-delivery methods.

- Two-way Communication: Audiences now have the means to respond directly to sources of information, research and opinion.

- Trading: The Internet provides the opportunity for purchase and sale of goods and services. Specifically, the Internet through the E-Commerce has provided the business community, among others, the following benefits:
  i.   Improved response time to clients' requests
  ii.   Improved competitive position
  iii. Eased the process of concluding deals and financial transactions
  iv.   Extended market reach and increased revenue potentials
  v.   Increased consumer convenience and choice
  vi.   Reduced prices
  vii. Improved customer service

SERVICES OFFERED ON THE INTERNET

The major Internet services are as follows:

Electronic Mail (e-mail): This is the most popular and most utilized Internet service especially in the developing countries of the world. A conservative estimate puts the number of people using the e-mail worldwide at more than 90 million people. E-mail is message sent from one person to another via a computer network. The same e-mail can be sent easily to one address or many addresses. Commercial electronic mail is used for the same purposes as the organization wide mail system. But instead of being limited to members of one organization, the service is made available to the public on subscription bases.

E-mail messages are exchanged between customers, suppliers, friends and business partners. E-mail service has cut down on the cost of mailing or sending information thus saving time and money. E-mail is used as a marketing tool, for example, a company, Dealaday.com uses e-mail to prospect for customers and sends group e-mail to 10,000 user names all customers who have indicated they would like to receive e-mails. With e-mail they receive a 7%, 8% and sometimes 10% response, unlike 1% or 2% response in normal direct marketing.

The World Wide Web (WWW): The World Wide Web or the web is one of the Internet's most popular applications and it was launched in 1991. It is a graphical, easy–to-use way to organize and present information, including texts, images, movies, sounds and more.
The World Wide Web has generated tremendous popular interest in the Internet. The www is unique for two reasons. Firstly it is highly interactive media bringing documents in graphics, audio and video. Secondly, it uses hyperlink, which provides connections between different resources. It allows users to jump from one page to another.
A file in www is called the home page and usually contains a multimedia clip. A page can link you to other web pages and Internet resources with clicks of a mouse. You can view and download any information you need on any home page with the aid of software known as the web browser.

File Transfer Protocol (ftp): File transfer protocol (ftp) is an Internet tool used to transfer files between computers and it is the most common method of transferring files on the Internet. Without viewing them as they are transferred the ftp enables you to access file on a remote location on the Internet once you log on to an ftp site, and you are able to access all files on sites and download them if you so desire. It is fairly easy to publish information on the Internet. Many institutions maintain publicly accessible archive of information that they want to share with others.

Telnet: Telnet is an Internet service that allows you to connect to a remote computer to use specific databases or other applications available on that computer. Telnet is one of the first applications widely used on the Internet. Many telnet applications are now available on the World Wide Web where they are easier to use.

Internet Conference: This is an Internet service whereby different techniques are used to allow people to discuss topics of mutual interest. A conference can be as simple as sending e-mail to many different people or as complex as arranging to have people link different cities, see images of each other and hear each other talk in real time- that is video conferencing. Internet conferencing is possible, but the technology becomes more complex and the speed of the connection becomes more important as you go from text only, to transmitting sound and video in real time. Internet conference brings about tremendous savings on travelling, time and money.

Internet Telephony: This is a service in which you can use the Internet as a voice telephone line. With some types, both you and the person you are calling must have an Internet connection and be online at the time you wish to talk. Some companies also offer Internet-to- telephone services where from your computer you can call any telephone number in the world. Internet telephone services are inexpensive when you compare them with the conventional cost of telephone services. If your organization spends a lot of money on long distance telephone calls, this might be a good option for you. There are growing numbers of companies providing Internet telephone services.

Internet Fax: Internet fax is a service that takes a special type of e-mail message and sends it to a fax machine specified in the message. The message can be faxed to a computer (Internet-to-Internet).

THE INTERNET SERVICE PROVIDER (ISP)
For a modem to bring information, it must have a number to dial. This is where an Internet service provider (ISP) comes in. The ISP is the organization that gives a subscriber access to the information super highway. So to be connected to the Internet you need to subscribe to an ISP. There are several ISPs scattered all over the world; some of the popular ones are American Online (AOL), UK Line and CompuServe. Here in Nigeria, some of the common ones are Hyperia, Infoweb, Cyberspace, Linkserv, Nigeria Online, Nigeria Net, Nitel, Nova, Prodigy, etc. The choice of an ISP depends mostly on the effectiveness in the transmission of information, that is, speed of service is an important criterion for selecting an ISP. The efficiency of an ISP, in terms of speed of transmission of information, can be determined by the bandwidth it can support. A bandwidth

is a measure of the amount of data line, satellite link etc. The bandwidth available determines the total capacity of an ISP to move data anywhere in the world**.**

INTRANET

An intranet is a local area network that companies use to distribute information and speed up the movement of data within offices. In other words an intranet allows the job of processing to be distributed among multiple computers. Intranet activities usually take place behind secure 'firewalls' that only authorized users have access to.

An intranet can span multiple business locations via the Internet. Intranets are built using the same standard Internet software such as TCP/IP, e-mail client, web browser and telephone dialer.

EXTRANET

When a company makes open its internal network or intranet to selected business partners, the intranet becomes an extranet. Suppliers, distributors and other authorized users can then connect to the company's network over the 'Net' or through virtual private networks. Once inside, they can view the data the company makes available.

COMPUTER MEMORY

The main function of computer memory is to store software. Computer memory is divided into two: Primary memory and Secondary memory.

Primary memory

Primary memory is divided into Random Access Memory (RAM) and Read Only Memory (ROM).

Secondary memory:

Secondary memory are called storage device. Example of secondary memory devices are: Hard disk, floppy disks, CD ROMs etc

NOTE:

- ***The CPU can read and write to RAM but can only read from the ROM but not write into ROM.***
- ***RAM is volatile but ROM is not volatile.***

READ ONLY MEMORY (ROM)

Read-only memory (ROM) chips are located on the motherboard and other circuit boards. ROM chips contain instructions that can be directly accessed by a CPU. Basic instructions for operation, such as booting the computer and loading the operating system, are stored in ROM. ROM chips retain their contents even when the computer is powered down. The contents cannot be erased or changed by normal means.

NOTE:

Read only memory (ROM) chips: Information is written to a ROM chip when it is manufactured. A ROM chip cannot be erased or re-written and is obsolete.

CATEGORIES OF ROM

- **Programmable Read-Only Memory (PROM)**

  Programmable read only memory. Information is written to a PROM chip after it is manufactured. A PROM chip cannot be erased or re-written.

- **Erasable Programmable Read Only Memory (EPROM)**

Erasable Programmable Read Only Memory. Information is written to an EPROM chip after it is manufactured. An EPROM chip can be erased with exposure to UV light. Special equipment is required.

- **Electrically Erasable Programmable Read Only Memory (EEPROM)**

Electrically erasable programmable read only memory. Information is written to an EEPROM chip after it is manufactured. EEPROM chips are also called Flash ROMs. An EEPROM chip can be erased and re-written without having to remove the chip from the computer.

PROGRAMMING LANGUAGES

There are three categories of programming languages:

1. Machine languages (ML)
2. Assembly languages (AL)
3. High-level languages (HLL)

The ML and AL are classified as *Low-Level Languages (LLL).*

Machine Lanaguage (ML)
This is the fundamental language of the computer's processor. It is made up of binary-coded instructions, which is used directly by the computer. All programs are converted into ML before they can be executed. The language consists of 0's and 1's. Example: 100101, 010011

Advantages

- Fast and efficient
- Machine friendly
- No translation is required

Disadvantages

- Not portable
- Not programmer friendly

Assembly Lanaguage (AL)

Also a low-level language (LLL) which is similar to the machine language is the AL. It was developed to make programmers job easier. It uses symbolic operation code to represent the machine operation code.

Symbolic operation codes are in an easy-to-remember form called ***mnemonics***.

Assembly languages have some of the advantages and all of the disadvantages of machine languages.

Advantages

It is machine friendly as compare to high-level language

Disadvantages

- Not portable
- Not programmer friendly

Compare the following machine language and assembly language programs:

8086 Machine language program for var1=var1+ var2	8086 Assembly language program for var1=var1+ var2
1010 0001 0000 0000 0000 0000 0000 0011 0000 0110 0000 0000 0000 0010 1010 0011 0000 0000 0000 0000	MOV AX, var1 ADD AX, var2 MOV var!, AX

High Level Lanaguage (HLL)

The HLL began to appear in the 1950's – COBOL is an example of such early HLL used to create complex computer programs without necessarily knowing how the CPU works and without writing a large number of low-level instructions. The HLL uses English like statements such as PRINT, WHILE, GOTO etc.

A high level language has two primary components:

1. A set of built-in language primitives and grammatical rules
2. A translator

HLL program consists of English-like statements that are governed by a strict syntax.

Advantages

- Portable or machine independent
- Programmer-friendly

Disadvantages

- Not as efficient as low level languages
- Need to be translated

Examples are C++, Visual Basic, Pascal, etc.

LANGAUGE TRANLATORS

As mention earlier, one of the disadvantages of a high-level language is that it must be translated to machine language. High level languages are translated using translators.

A language translator translates a high level language program or an assembly language program into a machine language program.

TYPES OF TRANSLATORS

- Assemblers
- Compilers
- Translators

ASSEMBLERS

An assembler is a program that translates an assembly language program, written in a particular assembly language, into a particular machine language

COMPILERS

A compiler is a program that translates a high level language program, written in a particular high level language, into a particular machine language.

INTERPRETERS

An interpreter is a program that translates a high level language program, one instruction at a time, into machine language. As instruction is translated it is immediately executed. Interpreted program are generally slower than compiled programs because compiled programs can be optimised to get faster execution.

NOTE:

- Some high level languages are compiled while others are interpreted.
- There are also languages like Java, which are first compiled and then interpreted.