

Knowing Computers

1.0 Introduction

Welcome to the wonderful world of computing! This book presumes that you have little or no experience with the device commonly known as the PC (personal computer). Hopefully, this resource will aid you in some of the basic activities that are commonly performed with a PC.

1.1 Objectives

In this lesson we will learn about:

- What is Computer
- Components of Computer System
- Data and information
- Hardware and Software
- Applications of IECT
- Connecting basic devices to the CPU

1.2 What is Computer?

A computer is an electronic device that receives input, stores and manipulates data or information, and provides output in the desired format. Computers handle instructions flawlessly and fast. They must follow explicit directions from both the user and computer programmer. Computers are really nothing more than a very powerful calculator with some great accessories. Applications like word processing and games are just a very complex math problem.

1.2.1 Basic Applications of Computer

As we discussed earlier, computer is present in a variety of places, from schools and offices to the big manufacturing units; from our homes to banking institutions. Therefore, we can say that a computer has wide ranging applications. We are discussing some of the applications in brief.

1. **Word Processing** - If you want to work with text, like typing a letter, writing books, reading e-books, etc, you can use any word processing software available. Such software makes your work easier and better by providing you writing and editing tools. Some of the typical features of a word processor include:
 - Different fonts styles, sizes and colours
 - Copy and paste
 - Spelling and grammar checking
 - Inserting images, tables, charts, etc.
2. **Making Presentations** – We need to make presentations to vendors, clients or our seniors all the time. Presentation software enables us to create presentations easily and lets us collate data of different types like text, tables, figures, audio, video, etc. together.
3. **Desktop Publishing** - Desktop publishing software enables you to create layouts for pamphlets, banners, handouts and books.

4. **Internet** - Internet is a global network of computers. Through the internet you have fast and easy access to information stored in all the computers. Besides accessing information, you can use e-mail to send messages or chat feature to talk with online friends. Offices are finding it increasingly useful to use video conferencing to hold meetings with executives scattered across offices worldwide.
5. **Banking** – Computers are used in banks as they can do complex calculations at very fast speeds and store large amount of data.
6. **Medicine** – We see computer terminals in all hospitals we need to visit. They are used for administrative purposes as well as during diagnosis, surgery and curing. Computers are widely used in research and discovering cures for deadly diseases.
7. **Telecommunications** – Mobile phones are an important part of our lives. These phones have software embedded in them for everything we do using it – right from talking and messaging to listening to music.
8. **Education** – Computers have proved a boon to students in form of CBTs, e-learning software and online tutorials. You can attend classes from the comfort of your home, get guided by tutors though the internet or take exams online.

Whatever uses we have discussed are but the tip of an iceberg. The computer and embedded software is present everywhere. Be it washing machines, televisions, microwave ovens at home; film studios, scientific research centres, space exploration centres or the defence systems working at our borders, everything uses chips and software.

1.3 Components of Computer System

Computer system is made up of following components:

1. Central processing unit
2. Input devices
3. Output devices
4. Storage devices
5. Auxilliary devices

1.3.1 Central Processing Unit (CPU)

The central processing unit (CPU) is the brain of the computer. All the mathematical calculations and logical comparisons are done by the CPU. It also activates and controls the operations performed by all other units of the computer system. The CPU has three components:

1. **Control Unit (CU)** – As the name suggests, CU is the unit that controls all the instructions to be carried out by the CPU. All the other units and devices interact with each other via CU, not directly.
2. **Arithmetic Logic Unit (ALU)** – This is the part of the CPU that actually does the calculations and comparisons based on the instructions received from the CU.
3. **Main Memory** – Data and instructions related to the process being carried out by the CU are stored in the main memory or the primary memory.

1.3.2 Keyboard, Mouse and VDU

Keyboard

The Keyboard is the primary input device used to communicate with the computer. A computer keyboard closely resembles a conventional typewriter keyboard with additional keys like function keys, arrow keys, etc.

Mouse

Mouse is an input device used to point at objects on the computer monitor and select them. It is also called pointing device.

VDU (Visual Display Unit) or Monitor

Visual Display Unit (VDU) is an output device used to display results. The Computer Monitor is also used to display the data being entered by the user.

1.3.3 Other Input Devices

Keyboard and mouse are the two main input devices of a computer system. Other than these two, we are discussing some other input devices that can be attached to the computer.

Barcode readers

A barcode reader, also known as a point of sale (POS) scanner is a hardware device capable of reading a barcode and printing out the details of the product or logging that product into a database. A perfect example of a barcode reader is a super market barcode scanner that reads and logs the price of a product.

Digital Camera

A camera stores the pictures or video in electronic format. These can be directly uploaded to the computer system.

Joystick

A joystick allows an individual to easily move an object in a game such as navigating a plane in a flight simulator.

Optical scanner

Optical scanner is an input device that allows a user to take an image or text and convert it into a digital file, allowing the computer to read or display the scanned object.

1.3.4 Other Output Devices

Printer

A printer is used to print data sheets, documents, pictures, etc. on paper.

Speaker

A speaker gives you sound output from your computer. Some speakers are built into the computer and some are attached externally.

Headphones

Headphones also give sound output from the computer. They are similar to speakers, except they are worn on the ears so only one person can hear the output at a time.

1.3.5 Computer Memory

Just like humans, computers rely a lot on memory. They need to process and store data, just like we do. However, computers store data in digital format, which means the information can always be called up exactly the way it was stored. Also, unlike our memory, the computer's memory doesn't get worse over time. There are two types of memory in a computer:

1. Primary Memory – RAM and ROM
2. Secondary Memory – Hard disk

Random Access Memory

When your computer boots up, it loads the operating system into its random access memory, or RAM. This allows your computer to access system functions, such as handling mouse clicks and keystrokes, since the event handlers are loaded into RAM. Whenever you open a program, the interface and functions used by that program are also loaded into RAM.

Read Only Memory (ROM)

This type of memory is active, regardless of whether the system is turned on or is switched off. It is a kind of permanent non-volatile storage memory. As the name 'read only' suggests, the contents in it cannot be changed or modified. It is an integrated circuit which is pre-programmed with important data that should necessarily be present for the computer to carry out its normal functionalities.

Cache

Cache is a kind of RAM which a computer system can access more responsively than it can in regular RAM. The central processing unit looks up in the cache memory before searching in the central memory storage area to determine the information it required. This rules out the need for the system to search for information in larger and bigger memory storage areas, which in turn leads to a faster extraction of data.

Computer Hard Drive

These devices are important data storage components that are installed in the CPU. Their memory ranges widely, and a user may choose the memory depending on the data needed to be stored and accessed. Nowadays, hard drives having a memory capacity of 250 gigabytes to 1 terabytes are normally used.

Flash Memory

This is a non-volatile kind of memory which is intended to contribute to portable storage and a convenient transfer of data from one computer to another. The data in it can be erased and re-programmed as per the user's requirements. It only has a specific number of erase and write cycles that it can withstand, after which it creates a tendency to lose out on the stored information. Memory cards and USB flash drives are some modes of this type of memory storage.

These are just the common computer memory types which facilitate memory and data storage. However, there are many subtypes which are sorted out according to the memory-related functionalities they perform and the requirements they serve.

1.4 Concept of Hardware and Software

1.4.1 Hardware

Computer hardware refers to the physical parts of a computer and related devices. Internal hardware devices include motherboards, hard drives, and RAM. External hardware devices include monitors, keyboards, mice, printers, and scanners. The internal hardware parts of a computer are often referred to as **components**, while external hardware devices are usually called **peripherals**. Together, they all fall under the category of computer hardware. A typical computer (Personal Computer, PC) contains in a desktop or tower case the following parts:

- Motherboard which holds the CPU, main memory and other parts, and has slots for expansion cards
- Power supply - a case that holds a transformer, voltage control and fan
- Hard disk, floppy disk and other drives for mass storage
- Interface controllers (parallel, serial, USB, Firewire) to connect the computer to external peripheral devices such as printers or scanners

1.4.2 Software

In general, computer software is the general terminology to describe computer programs. Software needs to be accessed before it can be used. There are many terms used for process of accessing software including running, executing, starting up, opening, and others. Computer programs allow users to complete tasks. A program can also be referred to as an application and the two words are used interchangeably. Examples of software programs or applications would be the Operating System (DOS, Windows7, O/S2, UNIX, etc.), Word processor (typing letters), Spreadsheet (financial info), Database (inventory control and address book), Graphics program, Internet Browser, Email and many others. Also, any document that you create, graphic you design, sound you compose, file you make, letter you write, email you send or anything that you create on your computer is referred to as software. All software are stored in files. Software is stored on a disk or tape whether that disk is a floppy, hard Disk, CD, tape or one of the dozens of other storage devices available. Software can be divided into two general classes: **systems software** and **applications software**.

1.4.2.1 Application Software

Application software is a program designed to perform a specific function directly for the user or, in some cases, for another application. Application software (also called **end user programs**) includes database programs, word processors and spreadsheets. Applications software is unable to run without the operating system and system utilities.

1.4.2.2 System Software

System software is computer software designed to operate the computer hardware and to provide and maintain a platform for running application software.

The most basic types of system software are:

1. **BIOS and device firmware** – they provide basic functionality to operate and control the hardware connected to or built into the computer.
2. **Operating System** – IT allows the parts of a computer to work together by performing tasks like transferring data between memory and disks or rendering output onto a display device. It also provides a platform to run high-level system software and application software.
3. **Utility software** – It helps in analyzing, configuring, optimizing and maintaining the computer.

1.5 Concept of Computing, Data and Information

Data

Data is a collection of facts, figures and statistics related to an object. Data can be processed to create useful information. Data is a valuable asset for an organization. Data can be used by the managers to perform effective and successful operations of management. It provides a view of past activities related to the rise and fall of an organization. It also enables the user to make better decision for future. Data is very useful for generating reports, graphs and statistics.

Example

Students fill an admission form when they get admission in college. The form consists of raw facts about the students. These raw facts are student's name, father name, address etc. The purpose of collecting this data is to maintain the records of the students during their study period in the college.

Information

The manipulated and processed form of data is called information. It is more meaningful than data. It is used for making decisions. Data is used as input for processing and information I output of this processing.

Example

Data collected from census is used to generate different type of information. The government can use it to determine the literacy rate in the country. Government can use the information in important decision to improve literacy rate.

1.6 Applications of Information, Electronics and Communication Technology (IECT)

1.6.1 e-Governance

Governance refers to the exercise of political, economic and administrative authority in the management of a country's affairs, including citizens' articulation of their interests and exercise of their legal rights and obligations. E-governance may be understood as the performance of this governance via the electronic medium in order to facilitate an efficient, speedy and transparent process of disseminating information to the public and for performing government administration activities. E-governance can bring about a change in the way citizens relate to governments and to each other. E-governance can bring forth new concepts of citizenship, both in terms of citizen needs and responsibilities. Its objective is to engage, enable and empower the citizen.

Why introduce e-governance?

The purpose of implementing e-governance is to enhance good governance. Good governance is generally characterized by participation, transparency and accountability. The recent advances in communication technologies and the Internet provide opportunities to transform the relationship between governments and citizens in a new way, thus contributing to the achievement of good governance goals. The use of information technology can increase the broad involvement of citizens in the process of governance at all levels by providing the possibility of on-line discussion groups and by enhancing the rapid development and effectiveness of pressure groups. Advantage for the government is that the government may provide better service in terms of time and making governance more efficient and more effective. In addition, the transaction costs can be lowered and government services become more accessible.

The fields of implementation of e-governance are:

- **e-administration** – It refers to improving government processes and the internal working of public sector with new ICT-executed information processes.
- **e-services** – It refers to improved delivery of public services to citizens. Some examples of interactive services are – requests for public documents, requests for legal documents and certificates, issuing permits and licenses.
- **e-democracy** – It implies greater and more active citizen participation and involvement enabled by ICTs in the decision-making process.

1.6.2 Entertainment

In today's electronic era computers have invaded almost every field of our life and entertainment is no exception. With advancement in computer hardware and widespread reach of Internet, computer has become a useful tool in entertainment. Using computer you can listen to music, watch movies and DVDs, play games and even hook up your cable connection. All this has been possible due to advancement in multimedia concept of computers and accompanying progress in computer hardware. Multimedia is a combination of pictures, audio, video, animation, and text for improving content displayed by the computer. E.g. using Microsoft Windows XP Media Center Edition, you can run almost anything (DVD, MP3, iPad, home theatre system, etc.) you want using your computer as the hub.

1.7 Bringing Computer to Life

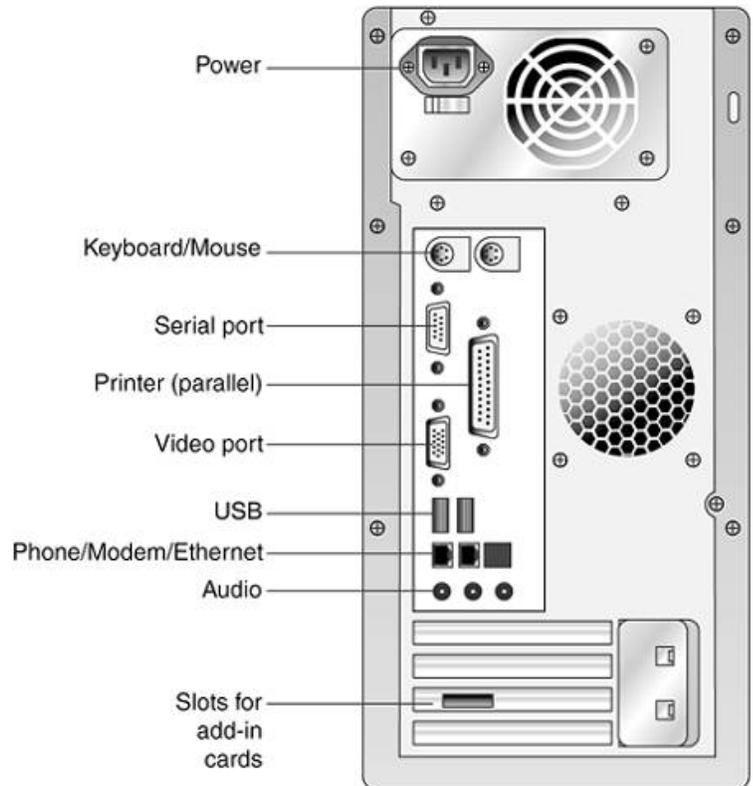
1.7.1 Connecting Keyboard, Mouse, Monitor and Printer to CPU

When connecting the PS/2 keyboard, ensure the computer is off; if the keyboard is a USB keyboard the computer can be off or on during the installation.

PS/2 Keyboard

Follow these steps to connect your PS/2 keyboard to CPU:

1. Connect the keyboard to the PS/2 port on the back of the computer.
2. When looking at the back of the computer you may notice two PS/2 ports next to each other. Verify you're connecting the keyboard into the purple connection as shown in the picture.
3. If your PS/2 ports are not color coded the keyboard will be the connection closest to the left edge of the computer (when looking at it from the back).
4. If the connections are vertical and not horizontal as shown, the keyboard connection may be either depending on the type of case and motherboard. Look for a small symbol next to the port to identify which one is the keyboard.



USB Keyboard

Connect the USB keyboard to the USB ports on the back or front of your computer, or if you are using a USB port hub, connect the mouse to the hub.

Install Software / Drivers

If your keyboard has any special features such as a built in touch pad or special buttons or is wireless, for these features to work properly, the software and/or drivers for the keyboard must be installed after the computer keyboard has been connected to the computer.

Installing a PC computer mouse

When connecting the PS/2 or Serial mouse, ensure the computer is off; if the mouse is a USB mouse the computer can be off or on during the installation.

PS/2 Mouse

Connect the mouse to the PS/2 port on the back of the computer. Today, although many computers are still using PS/2 mice if you're using a USB mouse, skip to the next section. When looking at the back of the computer you'll notice two PS/2 ports next to each other. Verify you're connecting the mouse into the teal or green connection.

Serial Mouse

Connect the mouse to the serial port on the back of the computer. If the computer has serial devices currently connected to the computer and the computer has two serial ports we recommend you use the first serial connection if you encounter problems connecting the mouse. Once connected, depending on your computer setup, you may need to configure the mouse in CMOS setup as found in the next section.

USB Mouse

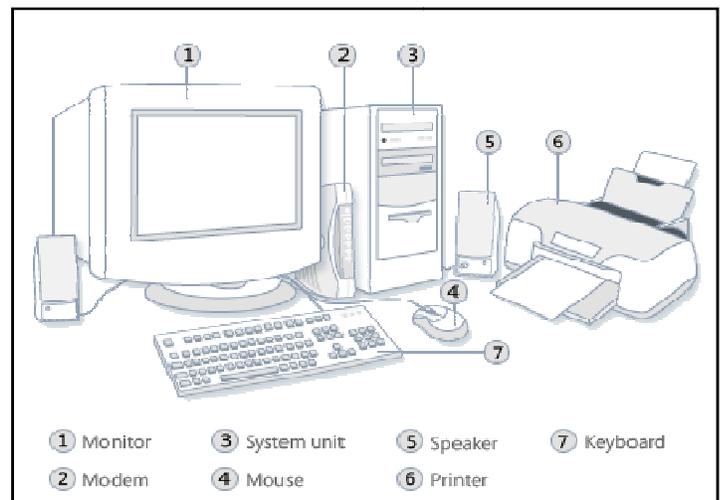
Connect the USB mouse to the USB ports on the back or front of your computer or if you are using a USB port hub, connect the mouse to the hub.

Setup in CMOS setup

If you've connected a serial or USB mouse it may be necessary to setup the ports in CMOS setup. If the mouse you're using is a serial mouse and it's having issues being detected verify that the serial ports or COM ports are enabled and assigned properly in CMOS. If the mouse was a USB mouse, ensure that USB is enabled and if available, also ensure that the USB Legacy support is also enabled; this allows the mouse to work in legacy mode, for example DOS.

Connecting Monitor and printer

Put your printer in the position you want. If you have a laser printer, allow a few inches of space on all sides for ventilation. Ink-jet printers don't require ventilation. Follow these steps to connect the printer:



1. Turn off your computer and unplug the power cord.
2. Connect the white connector end of the DVI cable attached on the monitor to the connectors on the computer.
3. Connect the USB cable that was included with your monitor to the computer and the upstream USB connector on the monitor. Once this cable is connected to the computer and the monitor, you can use the USB downstream on the monitor.
4. Connect any USB device.
5. Connect the power cord.
6. Turn on your monitor and computer. If you do not see an image, see Troubleshooting Your Monitor.
7. Buy a bidirectional, IEEE 1284-compliant parallel printer cable. (Printers rarely come with cables) or USB cable suitable with the specific printer.
8. Shut down the computer, but leave it plugged into the surge suppressor.
9. Compare the connectors at the opposite ends of the cable.
10. Attach the 25-pin end of the cable to the parallel, or printer, port on the computer (the plug will go in only one way) or the required USB connection in proper port.
11. Tighten the hand screws securely for parallel port.
12. Connect the other end of the cable into the printer's socket.
13. Latch the retaining clips (on most printer ports).
14. Plug the power cord into the printer and into the surge suppressor.
15. Turn on the printer.
16. Install cartridges according to the printer manufacturer's instructions.
17. Turn on the computer.
18. Install printer driver software according to the manufacturer's instructions.
19. Add the printer to the list of printers your computer recognizes.

1.7.2 Checking Power Supply

To be able to test your computer's power supply, you can follow these instructions:

1. Turn off your power switch and plug it out from the power supply.
2. Remove the cable from the CPU and start unscrewing the power supply section in order to remove the whole power supply (square metal box) from the CPU.
3. Once done, locate the main ATX connector and find the green wire.
4. Also locate for the black wire near the green wire and with the use of a paper clip, connect and safely bond the two together with a piece of isolating tape.
5. Put back all the power supply and switch the system on again and ensure that your system ventilation is working.
6. To check whether the connection is correct, the Molex in between the yellow and black wire should display at least 12 volts.

