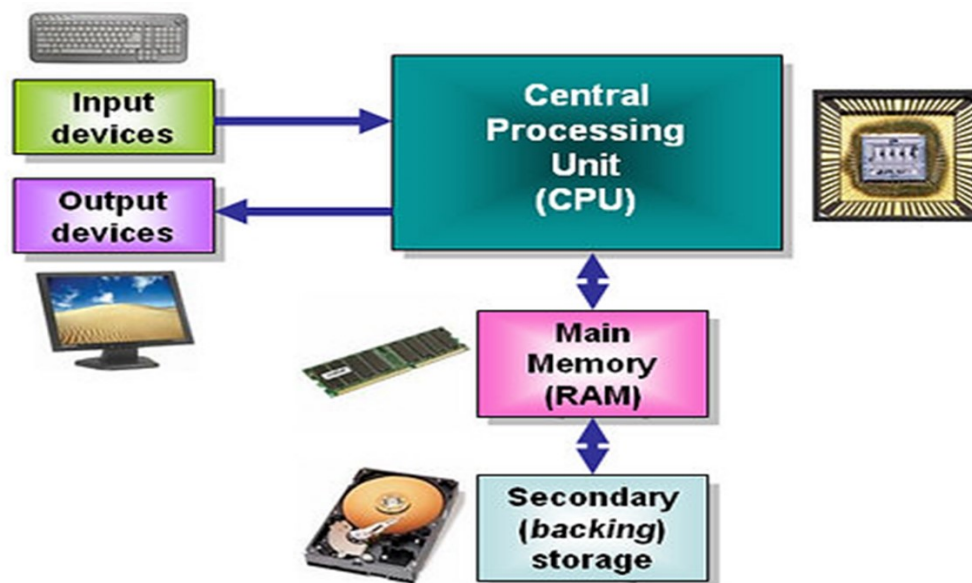# Computer 1
(COS-1211)
for First Year
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INTRODUCTION

Today, almost all of us in the world make use of computers in one way or the other. It finds applications in various fields of engineering, medicine, commercial, research and others. Not only in these sophisticated areas, but also in our daily lives, computers have become indispensable. They are present everywhere, in all the devices that we use daily like cars, games, washing machines, microwaves etc. and in day to day computations like banking, reservations, electronic mails, internet and many more.

The word **computer** is derived from the word **compute.** Compute means to calculate.

The computer was originally defined as *a super-fast calculator*. It had the capacity to solve complex arithmetic and scientific problems at very high speed.

But nowadays in addition to handling complex arithmetic computations, computers perform many other tasks like *accepting, sorting, selecting, moving, comparing* various types of information. They also perform *arithmetic* and *logical operations* on alphabetic, numeric and other types of information.

Computer Generations

Generation in computer terminology **is a change in technology a computer is/was being used.**

Initially, the generation term was used to distinguish between varying hardware technologies. Nowadays, generation includes both hardware and software, which together make up an entire computer system.

Following are the main five generations of computers:

❖ **First Generation (**1946-1959**):**
- Relied on machine language to perform operations.
- They could only solve one problem at a time.
- Input was based on punched cards and paper tape, and output was displayed on printouts.

Second Generation (1959-1965**):**

- The transistor was created, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable.

- Assembly languages and High-level programming languages were also being developed at this time.
- It is the first computers that stored their instructions in their memory.

❖ Third Generation (1965-1971):

- Integrated Circuit based.
- Users interacted with third generation computers through keyboards and monitors.
- 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.

❖ Fourth Generation (1971-1980):

- VLSI microprocessor based. In 1981 IBM introduced its first computer for the home user, and in 1984 Apple introduced the Macintosh.

- Those computers could be linked together to form networks, which eventually led to the development of the Internet.

- It also saw the development of GUIs (Windows OS), the mouse and handheld devices.

❖ **Fifth Generation (**1980-onwards):

- ULSI microprocessor based.
- The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self- organization (Artificial Intelligent).

APPLICATIONS OF COMPUTERS

Today computers find widespread applications in all activities of the modern world. Some of the major application areas include:

1. **Military.**
2. **Scientific, Engineering and Research.**
3. **Business.**
4. **Healthcare:** Computers have become an important part in hospitals, labs, and dispensaries. They are being used in hospitals to keep the record of patients and medicines. It is also used in scanning and diagnosing different diseases. ECG, EEG, ultrasounds and CT scans, etc. are also done by computerized machines.

Following are some major fields of healthcare in which computers are used:

- ❖ **Diagnostic System** - Computers are used to collect data and identify the cause of illness.
- ❖ **Lab-diagnostic System** - All tests can be done and the reports are prepared by computer.
- ❖ **Patient Monitoring System** – These are used to check the patient's signs for abnormality such as in Cardiac Arrest, ECG, etc.
- ❖ **Pharm Information System** - Computer is used to check drug labels, expiry dates, harmful side effects, etc.
- ❖ **Surgery** - Nowadays, computers are also used in performing surgery.

5. **Information:** This is the age of information. Television, Satellite communication, Internet, networks are all based on computers.
6. **Education.**
7. **Games and Entertainment.**
8. **Communication.**

Computer System and the Human Mind

The content of the human mind can be classified into four categories:

1. **Data**: symbols.
2. **Information**: data that are processed to be useful; provides answers to "who", "what", "where", and "when" questions.
3. **Knowledge**: application of data and information; answers "how" questions
4. **Wisdom**: evaluated understanding.

We need to understand that processing data produced Information and process Information produces Knowledge and so on

Advantage of Computer vs. Human Mind:

1. **Speed:** Smaller computers can execute thousands of instructions per second, while the more complex machines can execute millions of instructions per second.
2. **Accuracy:** They are capable of executing hundreds of instructions without any errors.
3. **Efficiency:** The computers can perform repeated tasks with the same efficiency any number of times without exhausting their selves.
4. **Storage Capability:** Computers are capable of storing large amounts of data in their storage devices.
5. **Versatility:** They are capable of performing no numerical operations fielding like: air-line reservation, electricity bills, data base management etc.

Limitations of Computers:

Although the computers of today are highly intelligent and sophisticated, they have their own limitations.

1. **No Intelligence:** A computer cannot take any decision on its own.
2. **Dependency:** It functions as per the user's instruction; thus, it is fully dependent on humans.
3. **Environment:** The operating environment of the computer should be dust free and suitable.
4. **Feeling:** It cannot make judgment based on feeling, taste, experience, and knowledge unlike humans.

Computers classification

Computers can be generally classified by *purpose, size and number of users* as follows:

❖ **Special-Purpose Computers:** As the name states, a Special-Purpose Computer are designed to be task specific and most of the times their job is to *solve one particular problem*. They are also known as *dedicated computers*, because they are dedicated to perform a single task over and over again.

   Such a computer system would be useful in:

   1) Playing graphic intensive Video Games.
   2) Traffic lights control system.
   3) Weather forecasting.

4) Oil exploration.
5) Automotive industries.
6) Keeping time in a digital watch.
7) Heart monitoring equipment
8) Global positioning satellite (GPS) navigation tools
9) Microwaves and other home appliances

❖ **Personal computer**: The personal computers are specially designed for general purpose. PC are widely used & the fastest growing computers. Its small, relatively inexpensive computer based on the *microprocessor* technology that enables manufacturers to put an entire CPU on one chip. Well known manufacturers of PC are Dell, Apple, Samsung, Sony and Toshiba.

❖ **Minicomputer:** Minicomputers may contain one or more processors, support multiprocessing and tasking, and are generally resilient to high workloads. Although they are smaller than mainframe or supercomputers, minicomputers are more powerful than personal computers and workstations.

❖ **Mainframe:** A powerful multi-user computer capable of supporting many hundreds or thousands of users simultaneously. For example: *Banks, Educational institutions and Control massive networks*.

❖ **Supercomputer:** An extremely fast computer that can perform hundreds of millions of instructions per second. Supercomputers are very expensive and are employed for specialized applications that require huge amount of mathematical calculations. For example: ***Weather forecasting, scientific simulations and Nuclear energy research.***

Computer System

Computer defined as a fast and accurate data processing system that accepts data, performs various operations on the data, has the capability to store the data and produce the results on the basis of detailed step by step instructions given to it.

*A computer system is made up of 4 main types of components:*

1) Hardware
2) Software (Software: Bringing the Machine to Life)
3) Data
4) People/Users.

The terms **hardware and software** are almost always used in connection with the computer.

1) **The Hardware:** The hardware is the machinery itself. It is made up of the physical parts or devices of the computer system .

A computer Hardware (consists of mainly four basic Units)

1.1) Input unit.
1.2) Storage unit.
1.3) Central processing (Arithmetic logic unit and control unit).
1.4) Output unit.
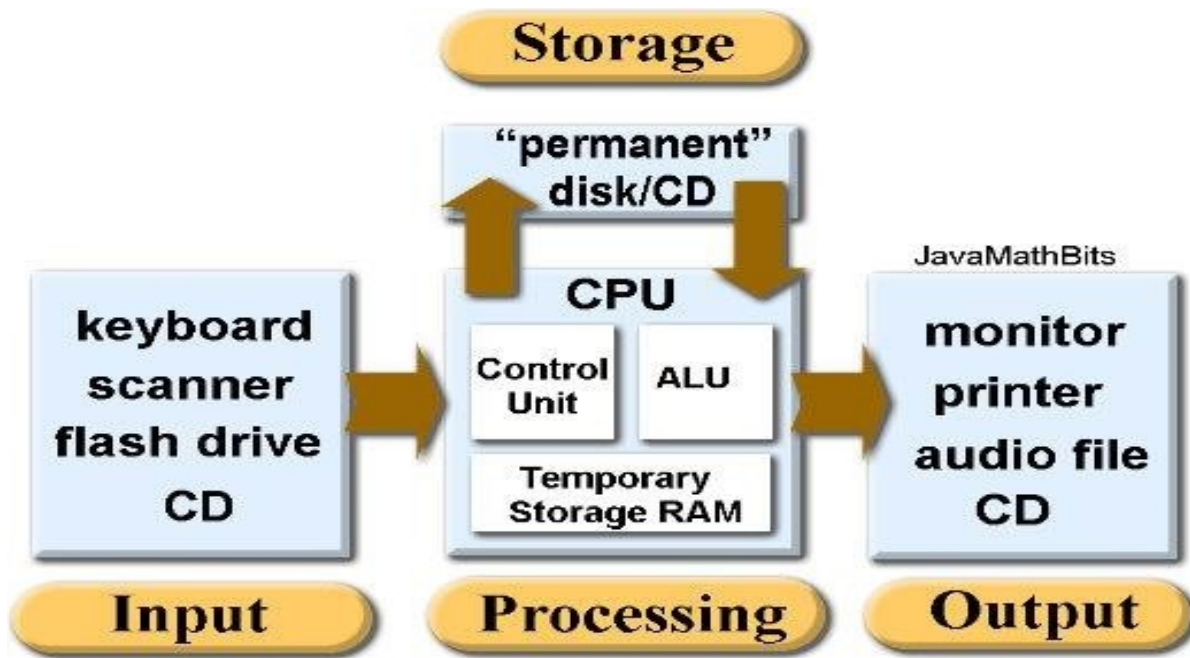
1.1) Input Unit: Input unit is any peripheral (piece of computer hardware) equipment which Translate data from **form** that humans understand to one that the computer can work with. Most common are *keyboard a*nd *mouse***.**

1.2) Storage Unit:
1.2.1) Primary Memory:
❖ RAM:

- Random Access Memory is a memory structure responsible for storing data on a temporary basis.
- It can be quickly accessed by the processor as and when needed.
- RAM is generally measured in GB (Gigabytes).
- RAM plays a huge part in the number of programs a computer can run simultaneously. If you've ever wondered why your computer may buckle under the pressure if 5 or 6 memory-demanding programs run at the same time, it's probably because it doesn't have enough RAM capacity to support them all.
- It is volatile memory; that is, what's held in RAM is only held there as long as the computer is on. If the data isn't moved to the hard drive before the computer is turned off, the data stored in RAM is flushed away.

❖ ROM (Read Only Memory):

- It's a type of storage medium that permanently stores data on personal computers (PCs) and other electronic devices.
- It contains the programming needed to start a PC, which is essential for boot-up;
- It performs major input/output tasks and holds programs or software instructions.
- Because ROM is read-only, it cannot be changed; it is permanent and non-volatile, meaning it also holds its memory even when power is removed.

1.2.2) Secondary Memory:-
Stores data and programs permanently, it's retained after the power is turned off.

❖ **Hard drive (HD):** A hard disk is part of storage unit, often called a "disk drive," "hard drive," or "hard disk drive," that store and provides relatively quick access to large amounts of data on an electromagnetically charged surface or set of surfaces.

1 Internal Hard disk   2 External Hard disk

❖ **Optical Disk:** an optical disc drive (ODD) is a disk drive that uses laser light as part of the process of reading or writing data to or from optical discs. Recently all drives are both readers and recorders, also called burners or writers.

There are three main types of optical media:
- **CDs** can store up to 700 megabytes (MB) of data.
- **DVDs** disc can store up to 8.4 GB of data.
- **Blu-ray**. Blu-ray discs, which are the newest type of optical media, can store up to 50 GB of data.

❖ **Flash Disk**: is an electronic (solid-state) non-volatile computer storage medium that can be *electrically* erased and reprogrammed.

- Flash disk from 8 to 256 GB are frequently sold, and less frequently 512 GB and 1 TB units.

- Flash memory doesn't usually degrade because of its age, but rather because of the number of write cycles, which means the more you delete and write new information, the more quickly the memory in the device will start to degrade.

- USB flash disk are often used for storage, data back-up and transfer of computer files.

- They are smaller, faster, have thousands of times more capacity, and are more durable and reliable because they have no moving parts.

1.3) Central Processing Unit (CPU): a CPU is brain of a computer. It is responsible for all functions and processes.The CPU is the most important element of a computer system.

The CPU is comprised of two main parts:

1.3.1) Arithmetic Logic Unit (ALU): Executes all arithmetic and logical operations. Arithmetic calculations like addition, subtraction, multiplication and division. Logical operation like compare numbers, letters, or special characters

1.3.2) Control Unit (CU): controls and co-ordinates computer components.

Speed measurement: The speed of Central Processing Unit (CPU) is measured by Hertz (Hz), Which represent a CPU cycle. The speed of CPU is known as Computer Speed.

CPU SPEED MEASURES	
1 cycle per second	**1 hertz or Hz**
1 million cycles per second or 1000 Hz	**1 MHz**
1 billion cycles per second or 1000 MHz	**1 GHz**

1.4) Output Unites: is any piece of computer hardware equipment used to converts the results of data processing from electronically generated information into human-readable form.

2) The Software:

- The computer hardware itself is not capable of doing anything on its own. It has to be given explicit instructions to perform the specific task.
- *Software* is a collection of programs which utilize and enhance the capability of the hardware**.**
- The *computer program* is the one which controls the processing activities of the computer.

2.1) Application software:

Application software tells the computer how to accomplish tasks the user requires.

Some important kinds of application software are:

Word processing programs,
spreadsheets, database management
software, presentation programs,
graphics programs, Web browsers,
Internet applications.

2.2) System software:

This type of software includes ***operating systems*** and different ***utilities*** to allow your system to run smoothly. System software often manages the computer's resources.

2.2.1) Utility software is designed to help analyze, configure, optimize or maintain a computer.

For Example:

- ❖ Anti-virus utilities scan for computer viruses.
- ❖ Backup software can make copies of all information
  stored on a disk and restore either the entire disk (e.g.
  in an event of disk failure) or selected files (e.g. in an
  event of accidental deletion).

2.2.2) Operating Systems: are the most important programs that run on a computer. Every general-purpose computer must have an operating system to run other programs.

Types of Operating System Interfaces

The way in which users communicate with the computer is called an 'interface'.
The interface is what we use to give the computer commands.

There are three types of operating system interfaces :

❖ *Command Line Interface (CLI)*

❖ *Graphical User Interface (GUI)*

Mouse used to control and command a pointer	*Icons can be clicked to open folders or activate commands*	*Menu items can be selected using the pointer.*

❖ *Touchscreen Interface*

Pinching	*Rotating* *Swiping*

3) Data

The basic unit used in computer data storage is called a bit (binary digit).Computers use these little bits, which are composed of ones and zeros, to do things and talk to other computers.

All your files, for instance, are kept in the computer as binary files and translated into words and pictures by the software (which is also ones and zeros). This two number system, is called a "binary number system" since it has only two numbers in it. The decimal number system in contrast has ten unique digits, zero through nine.

$$1 = 0\ 0\ 0\ 1 \quad \text{numerical value } 2^0$$
$$2 = 0\ 0\ 1\ 0 \quad \text{numerical value } 2^1$$
$$4 = 0\ 1\ 0\ 0 \quad \text{numerical value } 2^2$$
$$8 = 1\ 0\ 0\ 0 \quad \text{numerical value } 2^3$$

Size example

- ❖ 1 bit - answer to an yes/no question
- ❖ 1 byte - a number from 0 to 255.
- ❖ 90 bytes: enough to store a typical line of text from a book.
- ❖ 4 KB: about one page of text.
- ❖ 120 KB: the text of a typical pocket book.
- ❖ 3 MB - a three minute song (128k bitrate)
- ❖ 650-900 MB - an CD-ROM
- ❖ 1 GB -114 minutes of uncompressed CD-quality audio at 1.4 Mbit/s
- ❖ 8-16 GB - size of a normal flash drive

4) **Users**

All the persons (users) that use the computer can be considered as live ware. EX: Programmers, Graphic Designer, Data entry operator, Hardware technician, Network engineer, Data base Administrator, Web Designer, System Analyzer

Laptop types and Smartphone Computers

1) Laptop

- ❖ Laptops are portable computers and are small enough to sit on your lap.
- ❖ They can be used almost anywhere due to their small size and a built-in battery which powers the laptop when there is no access to a plug socket.
- ❖ Modern laptops are generally almost as powerful as a Desktop PC and are used for similar tasks and purposes.
- ❖ They have LCD screens (Liquid Crystal Display) which use low-power. This helps increase the run-time of a laptop's battery.

2) Notebook Computer

It is a battery- or AC-powered personal **computer** generally smaller than a briefcase that can easily be transported and conveniently used in temporary spaces such as on airplanes, in libraries, temporary offices, and at meetings.

3) Netbook

- ❖ Netbooks are smaller and lighter than **notebook** computers, which in turn are smaller and lighter than laptops.
- ❖ Netbooks can be used for similar tasks to a laptop (word processing, running a Web browser and connecting wirelessly to the Internet) but they are not as powerful and have much smaller screens.
- ❖ Cheaper because they do not come with certain components (such as CD/DVD drive).
- ❖ A netbook will have a slimmed-down operating system, a smaller-than-usual keyboard and very little (if any) storage space.

4) Smart Phone

- ❖ A **mobile phone**, known as a is a portable telephone that can make and receive calls over a radio frequency

- ❖ A **smartphone** or **smart phone** is a mobile phone with an advanced mobile operating system which combines features of a personal computer operating system with other features useful for mobile or handheld use.

- ❖ Most smartphones can access the Internet, have a touchscreen user interface, can run third-party apps, music players and camera phones.

What are Third-party apps: An application that is provided by a vendor other than the manufacturer of the device.

For example, the iPhone comes with its own camera app, but there have been camera apps from third parties that offered advanced features such as a self-timer and simple editing.

Viruses

A virus is a small piece of software that piggybacks on real programs. For example, a virus might attach itself to a program such as a spreadsheet program. Each time the spreadsheet program runs, the virus runs, too, and it has the chance to reproduce (by attaching to other programs).

- ❖ *E-mail viruses:* An e-mail virus travels as an attachment to e-mail messages, and usually replicates itself by automatically mailing itself to dozens of people in the victim's e-mail address book. Some e-mail viruses don't even require a double-click -- they launch when you view the infected message in the preview pane of your e- mail software .

- ❖ *Trojan horses:* A Trojan horse is simply a computer program. The program claims to do one thing (it may claim to be a game) but instead does damage when you run it (it may erase your hard disk). Trojan horses have no way to replicate automatically.

- ❖ *Worms:* A worm is a small piece of software that uses computer networks and security holes to replicate itself. A copy of the worm scans the network for another machine that has a specific security hole. It copies itself to the new machine using the security hole, and then starts replicating from there, as well.

There are some tips to avoid viruses and reduce their impact?

❖ Install anti-virus software from a reputable vendor. Update it and use it regularly.

❖ Use a virus scan before you open any new programs or files that may contain executable code. This includes packaged software that you buy from the store as well as any program you might download from the Internet.

❖ If you are a member of an online community or chat room, be very careful about accepting files or clicking links that you find or that people send you within the community.

❖ Make sure you back up your data (documents, bookmark files, important email messages, etc.) on disc so that in the event of a virus infection, you do not lose valuable work.

Thank you