

**Course Code: CC 101**  
**Fundamentals of Computer**

## **Unit – I: Introduction to Computers**

### **➤ Introduction to Computer**

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The word “*computer*” comes from the word “*compute*”, which means, “*to calculate*”. Hence, people usually consider a computer to be a calculating device that can perform arithmetic operations at high speed.

The term “*computer*” is derived from the Latin word “*computare*” which means to calculate.

### **➤ Definition**

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A *computer* can be defined as,

A *computer* is an electronic device which accepts data and instructions as input from user, then process on it according to the user’s instructions and gives the desired output to the user.

### **➤ Characteristics of Computers**

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Increasing popularity of computers has proved that it is very powerful and useful tool. The power and usefulness of this popular tool are mainly due to its following characteristics:

1. **Automatic:** An automatic machine works by itself without human intervention. Computers are automatic machine because once started on a job, they carry out the job (normally without any human assistance) until it is finished.

2. **Speed:** A computer is a very fast device. It can perform in a few seconds, the amount of work that a human being can do in an entire year. The speed of a computer is calculated in MHz (Megahertz), that is one million instructions per second.
3. **Accuracy:** In addition to being very fast, computers are very accurate. Accuracy of a computer is consistently high and the degree of its accuracy depends upon its design. A computer performs every calculation with the same accuracy.
4. **Diligence:** Unlike human beings, a computer is free from monotony, tiredness, and lack of concentration. It can continuously work for hours without creating any error and without grumbling.
5. **Versatility:** Versatility is one of the most wonderful things about a computer. Computers can be used to perform different task.

For example, they can be used to perform calculations, create documents, and listen to music and so on.

6. **Reliability:** Reliability refers to the ability to perform some standard operations without any failure.
7. **Power of remembering:** Computer can store and recall any amount of information because of its secondary storage capability.
8. **No I. Q.:** A computer is not a magical device. It possesses no intelligence of its own. Its I. Q. (Intelligent Quotient) is zero, at least until today.
9. **No Feelings:** Computers are devoid of emotions. They have no feelings and no instincts because they are machines.
10. **Connectivity:** Two or more computers can be connected together. This provides an easy sharing of data and resources.

## ➡ Basic Computer Organization

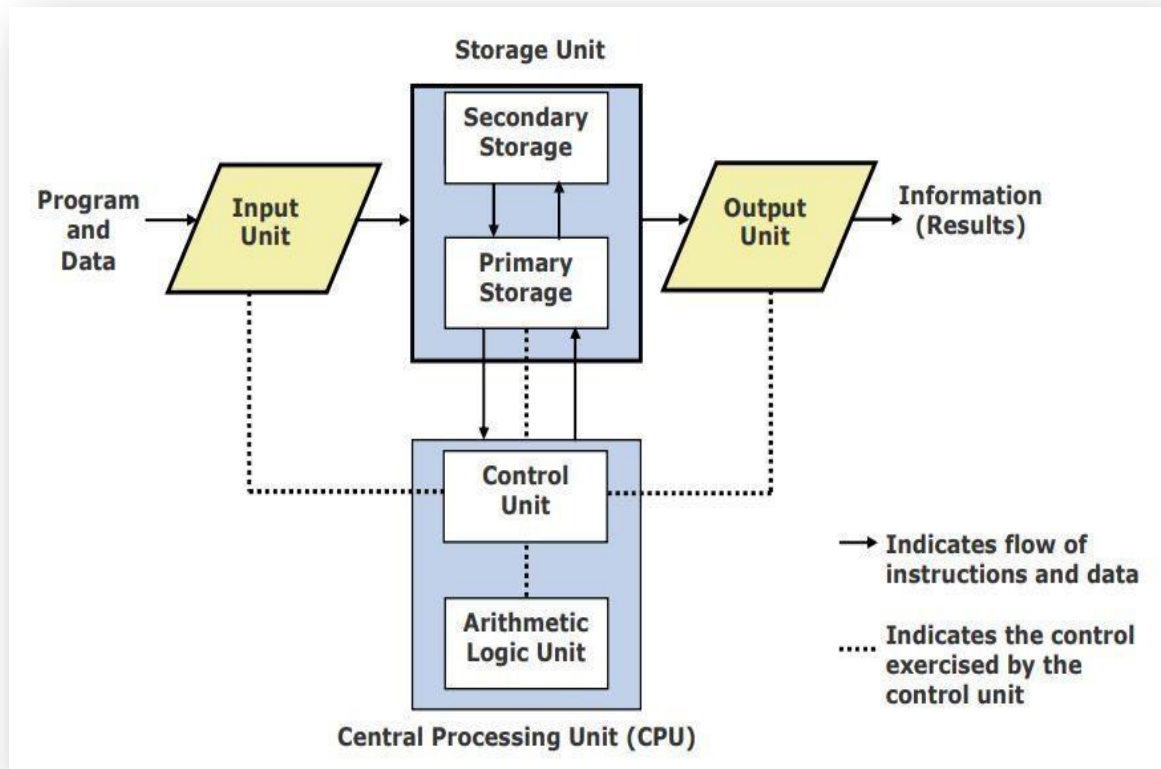
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Even though the size, shape, performance, reliability, and cost of computers have been changing over the years, the basic logical structure (based on the stored program concept), as proposed by Von Neumann, has not changed. No matter what shape and size of computer, all computer systems perform the following five basic operations for converting raw input data into useful information and presenting it to a user.

1. **Inputting:** The process of entering data and instructions into the computer system.
2. **Storing:** Saving data and instructions to make them readily available for initial or additional processing as and when required.
3. **Processing:** Performing arithmetic operations (add, subtract, multiply, divide, etc.) or logical operations (comparisons like equal to, less than, greater than, etc.) on data to convert them into useful information.
4. **Outputting:** The process of producing useful information or results for the user such as a printed report or visual display.
5. **Controlling:** Directing the manner and sequence in which all of the above operations are performed.

## ➡ Block diagram of Computer / Components of Computer System

A Computer System consists of three main components. Input unit, Central processing unit (CPU) and Output unit.



### 1. Input Unit

The input unit is formed by attaching various input devices to a computer. An input device is an electromechanical device used to provide data to the central processing unit for processing.

An input unit of computer system performs the following major functions:

- It accepts (or reads) instructions and data from outside world.
- It converts these instructions and data in computer acceptable form.
- It supplies the converted instructions and data to the computer system for further processing.

## 2. Output Unit

The output unit is formed by attaching the output devices to a computer. The basic functioning of the output device is just the opposite of the input device.

An output unit of computer system performs the following major functions:

- a) It accepts the results produced by the computer, which are in coded form and hence, we cannot easily understand them.
- b) It converts these coded results to human acceptable (readable) form.
- c) It supplies the converted results to outside world.

## 3. Central Processing Unit:

CPU, also known as the processor, is referred to as the brain of computer system.

- **Storage Unit/Memory Unit**

Memory unit refers to the part of Computer system where data and instructions are stored.

In short, a storage unit holds (stores):

- a) Data and instructions required for processing (received from input devices).
- b) Intermediate results of processing.
- c) Final results of processing, before they are released to an output device.

Storage unit of all computers is comprised of following two types of storage:

### a) Primary storage:

- ✓ Primary storage of a computer, also known as its *main memory*
- ✓ Used to hold running program instructions
- ✓ Fast in operation
- ✓ Small Capacity
- ✓ Expensive
- ✓ Volatile (loses data on power dissipation).

### **b) Secondary storage:**

- ✓ Secondary storage of a computer, also known as its *auxiliary memory*, is used to take care of the limitations of primary storage.
- ✓ Used to hold stored program instructions
- ✓ Slower than primary storage
- ✓ Large Capacity
- ✓ Lot cheaper than primary storage
- ✓ Retains data even without power.

- **Arithmetic Logic Unit (ALU)**

Arithmetic Logic Unit (ALU) of a computer system is the place where arithmetic or logical operation is to be performed. Almost all ALUs are designed to perform basic arithmetic operations (add, subtract, multiply, and divide) and logic operations or comparisons such as, less than, equal to, and greater than.

- **Control Unit (CU)**

Control Unit (CU) of a computer system manages and coordinates the operations of all other components of the computer system. Controlling of all operations like input, processing and output are performed by control unit. It takes care of step by step processing of all operations inside the computer.

## **➞ History of Computer**

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### **1. Abacus (5000 BC – 2000 BC)**

- The history of computers can be traced back thousands of years, to a device still used in many villages and sometimes, to teach children to count. It was the Abacus.
- Developed between 5000 BC – 2000 BC in Asia.
- Extensively used in China, Japan and Korea.
- Consists of beads strung on wire or thin rod to aid counting
- Expert Abacus users can perform stupendous calculations with Abacus.
- It is the most robust and most scalable version of the computer.

## **2. Log Tables (1614 AD)**

- In 1614, John Napier developed a system of multiplication and division using addition and subtraction.
- These were the famous 'Log Tables'
- A tabular representation of numbers that could be used to perform calculations like multiplication and division on large numbers quickly.

## **3. Napier's bones (1617 AD)**

- Using the system of log tables, Napier devised a simple calculation tool called 'Napier's Bones' in 1617
- IT consisted of specially marked rods that, when placed side by side in specific combinations, could give the quotients of large numbers.

## **4. The Slide Rule (1620s AD)**

- Using log tables, William Oughtred developed the Slide Rule in the 1620s
- The Slide Rule consisted of two movable rulers that could be adjusted to perform calculations.
- The slide rule made a handy pocket calculator and was used well into the 1960s until the development of small electronic calculators.

## **5. Pascaline (1642 - 1644 AD)**

- The Pascaline was designed and built by the French mathematician-philosopher Blaise Pascal between 1642 and 1644.
- He designed the machine to add and subtract two numbers directly and to perform multiplication and division through repeated addition or subtraction.
- Blaise Pascal developed a mechanical calculator to help his father,( a tax collector).

## **6. Stepped Reckoner (1672 - 1694 AD)**

- The Step Reckoner (or Stepped Reckoner) was a digital mechanical calculator invented by German mathematician.
- It was the first calculator that could perform all four arithmetic operations.

## **7. Difference Engine (1821 AD)**

- Charles Babbage began in 1821 with Difference Engine, designed to calculate and tabulate polynomial functions.
- The design describes a machine to calculate a series of values and print results automatically in a table.
- Difference Engine is the first complete design for an automatic calculating engine.

### **8. Analytical Engine (1832 AD)**

- In 1832 Babbage developed the Analytical Engine.
- The Analytical Engine is considered as a milestone signifying the start of the computer age.
- To input data into the machine, Babbage used a system of punch cards initially developed by Joseph Jacquard

### **9. Tabulating Machine & Punched Cards (1883 AD)**

- Herman Hollerith was an American inventor who developed an electromechanical punched card tabulator to assist in summarizing information and later it was used for accounting.

### **10. Electronic Stored Program Computer (1945 AD)**

- A stored-program computer is one that stores program instructions in electronic memory.
- A computer with a Von Neumann architecture stores program data and instruction data in the same memory.

## **➔ Evolution of Computer**

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The evolution of computers can be better understood by discussing some of the early known computers.

- 1) Mark-I Computer (1937-1944)**
- 2) The Atanasoff-Berry Computer (1939-1942)**
- 3) ENIAC or Electronic Numerical Integrator and Calculator.(1943-1946).**
- 4) EDVAC or Electronic Discrete Variable Automatic Computer. (1946-1952)**
- 5) EDSAC or Electronic Delay Storage Automatic Calculator. (1947-1949)**
- 6) UNIVACI or Universal Automatic Computer. (1951).**



## ➤ Generations of Computer

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- “Generation” in computer talk is a step in technology. It provides a framework for the growth of computer industry.
- Originally it was used to distinguish between various hardware technologies, but now it has been extended to include both hardware and software
- Till today, there are five computer generation.

Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some representative systems
First (1942-1955)	<ul style="list-style-type: none"><li>• Vacuum tubes</li><li>• Electromagnetic relay memory</li><li>• Punched cards secondary storage</li></ul>	<ul style="list-style-type: none"><li>• Machine and assembly languages</li><li>• Stored program concept</li><li>• Mostly scientific applications</li></ul>	<ul style="list-style-type: none"><li>• Bulky in size</li><li>• Highly unreliable</li><li>• Limited commercial use and costly</li><li>• Difficult commercial production</li><li>• Difficult to use</li></ul>	<ul style="list-style-type: none"><li>• ENIAC</li><li>• EDVAC</li><li>• EDSAC</li><li>• UNIVAC I</li><li>• IBM 701</li></ul>
Second (1955-1964)	<ul style="list-style-type: none"><li>• Transistors</li><li>• Magnetic cores memory</li><li>• Magnetic tapes</li><li>• Disks for secondary storage</li></ul>	<ul style="list-style-type: none"><li>• Batch operating system</li><li>• High-level programming languages</li><li>• Scientific and commercial applications</li></ul>	<ul style="list-style-type: none"><li>• Faster, smaller, more reliable and easier to program than previous generation systems</li><li>• Commercial production was still difficult and costly</li></ul>	<ul style="list-style-type: none"><li>• Honeywell 400</li><li>• IBM 7030</li><li>• CDC 1604</li><li>• UNIVAC LARC</li></ul>

Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some rep. systems
Third (1964-1975)	<ul style="list-style-type: none"> <li>▪ ICs with SSI and MSI technologies</li> <li>▪ Larger magnetic cores memory</li> <li>▪ Larger capacity disks and magnetic tapes secondary storage</li> <li>▪ Minicomputers; upward compatible family of computers</li> </ul>	<ul style="list-style-type: none"> <li>▪ Timesharing operating system</li> <li>▪ Standardization of high-level programming languages</li> <li>▪ Unbundling of software from hardware</li> </ul>	<ul style="list-style-type: none"> <li>▪ Faster, smaller, more reliable, easier and cheaper to produce</li> <li>▪ Commercially, easier to use, and easier to upgrade than previous generation systems</li> <li>▪ Scientific, commercial and interactive on-line applications</li> </ul>	<ul style="list-style-type: none"> <li>▪ IBM 360/370</li> <li>▪ PDP-8</li> <li>▪ PDP-11</li> <li>▪ CDC 6600</li> </ul>

Generation (Period)	Key hardware Technologies	Key software technologies	Key characteristics	Some rep. systems
Fourth (1975-1989)	<ul style="list-style-type: none"> <li>▪ ICs with VLSI technology</li> <li>▪ Microprocessors; semiconductor memory</li> <li>▪ Larger capacity hard disks as in-built secondary storage</li> <li>▪ Magnetic tapes and floppy disks as portable storage media</li> <li>▪ Personal computers</li> <li>▪ Supercomputers based on parallel vector processing and symmetric multiprocessing technologies</li> <li>▪ Spread of high-speed computer networks</li> </ul>	<ul style="list-style-type: none"> <li>▪ Operating systems for PCs with GUI and multiple windows on a single terminal screen</li> <li>▪ Multiprocessing OS with concurrent programming languages</li> <li>▪ UNIX operating system with C programming language</li> <li>▪ Object-oriented design and programming</li> <li>▪ PC, Network-based, and supercomputing applications</li> </ul>	<ul style="list-style-type: none"> <li>▪ Small, affordable, reliable, and easy to use PCs</li> <li>▪ More powerful and reliable mainframe systems and supercomputers</li> <li>▪ Totally general purpose machines</li> <li>▪ Easier to produce commercially</li> <li>▪ Easier to upgrade</li> <li>▪ Rapid software development possible</li> </ul>	<ul style="list-style-type: none"> <li>▪ IBM PC and its clones</li> <li>▪ Apple II</li> <li>▪ TRS-80</li> <li>▪ VAX 9000</li> <li>▪ CRAY-1</li> <li>▪ CRAY-2</li> <li>▪ CRAY-X/MP</li> </ul>

Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some rep. systems
Fifth (1989-Present)	<ul style="list-style-type: none"> <li>▪ ICs with ULSI technology</li> <li>▪ Larger capacity main memory, hard disks with RAID support</li> <li>▪ Optical disks as portable read-only storage media</li> <li>▪ Notebooks, powerful desktop PCs and workstations</li> <li>▪ Powerful servers, supercomputers</li> <li>▪ Internet</li> <li>▪ Cluster computing</li> </ul>	<ul style="list-style-type: none"> <li>▪ Micro-kernel based, multithreading, distributed OS</li> <li>▪ Parallel programming libraries like MPI &amp; PVM</li> <li>▪ JAVA</li> <li>▪ World Wide Web</li> <li>▪ Multimedia, Internet applications</li> <li>▪ More complex supercomputing applications</li> </ul>	<ul style="list-style-type: none"> <li>▪ Portable computers</li> <li>▪ Powerful, cheaper, reliable, and easier to use desktop machines</li> <li>▪ Powerful supercomputers</li> <li>▪ High uptime due to hot-pluggable components</li> <li>▪ Totally general purpose machines</li> <li>▪ Easier to produce commercially, easier to upgrade</li> <li>▪ Rapid software development possible</li> </ul>	<ul style="list-style-type: none"> <li>▪ IBM notebooks</li> <li>▪ Pentium PCs</li> <li>▪ SUN Workstations</li> <li>▪ IBM SP/2</li> <li>▪ SGI Origin 2000</li> <li>▪ PARAM 10000</li> </ul>

## ➡ Applications of Computer

Applications of Computer refer to the scope and use of the computer system in various fields and sectors. There is no doubt that computers are very productive and make our personal as well as day-to-day life more efficient and easier. You can use your computer system for different applications by switching to various programs and software packages.

Here are some of the basic applications of computer:

- 1. Application of Computer in Home:** Computers are used in homes for playing games, doing school work, writing letters, sending e-mails, watching movies, listening to music.
- 2. Application of Computer in Education:** Computers are extensively used in education. They are used to provide
  - a. Teaching and Learning Online
  - b. Result Processing
  - c. Student Data Processing
  - d. Question Preparation
  - e. Handouts and Notes Preparation
  - f. Online Education and Classes

- 3. Application of Computer in Communication:** Computers are used for communicating with people over the Internet. This includes chatting, video conferencing, instant messaging, web casting etc.
- 4. Application of Computer in Business:** Computers are used in organisations to store records, keep track of customer records, employee records etc.
- 5. Application of Computer in Banking and Finance:** Today banking is almost totally dependent on a computer. They are used to provide
  - a. Online Banking (e-banking).
  - b. Electronic Fund Transfer (EFT) Transactions.
  - c. Reading and sorting cheques with the help of MICR (Magnetic Ink Character Reader)
  - d. ATM (Automated Teller Machine) is used to either deposit or withdraw cash in/from banks.
- 6. Application of Computer in Hospitals:** Computers are used in hospitals for
  - a. To store patients records.
  - b. To collect data and identify the cause of disease and illness.
  - c. All tests can be done.
  - d. To check medicine labels, expiry dates, and harmful side effects, etc.
  - e. For performing surgery.
- 7. Applications of Computer in Weather Forecasting:** Computer software and programs are used for weather forecasting. The past and the present-day data help experts to predict the climate.
- 8. Applications of Computer in Hotel Management:** In Hotel Management sectors computers are used to keep and maintain the records of the guests who visited or stayed in the hotel.
- 9. Applications of Computer in Military:** Computers have now been a vital part of any security or defense forces of any country. It is the main tool that helps in the development of missiles and other equipment in the defense system. e.g.
  - a. Missile Control
  - b. Nuclear Weapon Control
  - c. Security and Army Communication
  - d. Military Operation and Planning
  - e. Smart Weapons Control
- 10. Applications of Computer in Agriculture:** The computer's arrival in agriculture and farming helps in several ways. Farmers can use computers with small business programs to keep records such as budget information, farm equipment inventories and animal health forms.

**11.Applications of Computer in Engineering:** Now days, computers are widely used in the Engineering sector. Computers are used to develop CAD (Computer-Aided Design) to design various products. And CAM (Computer Aided Manufacturing) to manufacture products.

**12.Applications of Computer in Movies:** Computers are used in movies to add “special effects “to a particular scene or the whole film.

**13.Applications of Computer in Government organizations:** Computers are used by government organization to keep track of the population, tax records etc.

**14.Applications of Computer in Library:** Computer software is used for the management of the library. It is used for keeping records of books, updating book records, and records of books issued or submitted.

**15.Applications of Computer in Advertising and Marketing:** In marketing, uses of the computer are :

- a. ***Advertising*** – With the help of computers, advertising professionals create graphics and media content, write and revise copy, and print the art and disseminate ads to sell more items and products to the customers.
- b. ***Online Shopping*** – Online Shopping (E-Commerce) has been made possible only because of computers. It catalogs that provide access to product information and allows direct entry of orders to be filled by the customers and place its order online.