



**COURSE TITLE: INTRODUCTION TO COMPUTER SCIENCE**

**COURSE CODE: CSC 101**

**COURSE UNIT: 3 UNIT**

**MODULE 1: INTRODUCTION TO COMPUTER SCIENCE**

**LESSON 1: Introduction To Computer Science**

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.

From revolutionizing, computers have become indispensable tools for communication, information access, and data analysis. They have opened new opportunities in education, business, and everyday life, shaping new kind of habits.

Without the development of the computer, our modern world of high technology would not have developed. Computers affect us all and are used in many of today's industries, some of which are: Banking transactions (Auto banks), Household accounts (Budgets), Automated manufacturing (Producing a modern car), Communications (Telephone systems), Shopping (Buying over the Internet)

In education, internet technologies have introduced a new education business model, while in healthcare, the use of computers has led to the creation of patient databases. Furthermore, the help of these **computer machine** has also transformed the way government officials work in the government sector, providing real-time information and high-speed processing.

Computers have completely **modernized the way** medical data is managed, enabling the maintenance of digital records for patient information. In the field of science and research, computers are indispensable for visualizing complex data.

Moreover, the use of computers in banking has significantly enhanced the accessibility of online resources for customers. In government offices and organizations, computers have revolutionized processes, leading to increased efficiency with the help of computers.

Additionally, computer technology has played a pivotal role in transforming social media platforms, saving a lot of time for users compared to traditional methods of communication.

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. This information



provided by the user to the computer is data. The information in one form which is presented to the computer is the input information or input data.

A **computer** is an electronic system that can ease the daily day to day activity of every individual when used intelligently. We can process data, save data, edit data and perform several other operations easily on a computer. **Computer** is omnipotent and omnipresent in today's time.

A computer is an electronic device that accept information (in the form of digitalized data) and manipulates it for some result based on a program, software or sequence of instructions on how the data is to be processed.

It can also be defined as an electronic device, operating under the control of instructions stored in its own memory that can accept data (input), process the data according to specified rules, produce information (output), and store the information for future use

## IMPORTANCE OF COMPUTER

Computer plays a major role in our lives. We use computers in education and research. We also use them for broadcasting news, receiving and sending messages to family and friends, making presentations, maintaining official and personal records, making weather forecasts, and for various other business and recreation activities. By using computers, we save a lot of time, effort, and money.

**1. Unlimited Access to Information:** Computers provide unlimited access to information. Through the Internet, humans can obtain up-to-date news, learn about specific topics, and explore a wealth of knowledge from all corners of the world. With speed and ease, computers have revolutionized the way we seek and acquire information.

**2. Enhanced Productivity in Various Professions:** In the workplace, computers have remarkably increased productivity. The use of office applications enables employees to complete tasks more efficiently. For instance, spreadsheets simplify data processing and analysis, while graphic design software assists creatives in producing impressive artwork and designs.

**3. Facilitating Communication and Social Interaction:** Computers have transformed the way people communicate. With the aid of emails, social media, and instant messaging



applications, individuals can connect with family, friends, and colleagues worldwide instantaneously. This has bridged distances between people and strengthened social bonds.

**4. Supporting the Education and Learning Process:** Computers play a vital role in the realm of education. They provide access to a vast array of learning resources, whether through online platforms, e-books, or educational video content. Computers are also used as teaching aids, with applications and software aiding in visualizing course material in more engaging and interactive ways.

**5. Fostering Creativity and Entertainment:** Computers have unlocked avenues for human creativity. Various creative software, such as video and audio editing, animation, and graphic design tools, empower artists and content creators to express their ideas and imaginations in ways previously inaccessible.

**6. Driving Innovation in Research and Development:** In research and development, computers play a pivotal role. They facilitate the analysis of big data, complex simulations, and modeling, which aids in problem-solving and discovery of novel solutions across various disciplines, such as medicine, astronomy, and engineering.

**7. Efficiency in Business and Financial Processes:** In the business world, computers significantly enhance operational efficiency. With accounting and business management software, financial reporting, inventory management, and performance monitoring can be automated and streamlined.

## COMPUTERS IN SOCIETY

The evolving relationship between computers and society refers to the dynamic and ongoing interaction, interdependence, and impact that information technology, computing systems, and digital innovations have on individuals, communities, and the broader social fabric. This relationship is characterized by a continuous and reciprocal influence between advancements in computer technology and their consequences for societal structures, norms, and behaviors. In general, the role of computer in the society can be divided into several groups.

### Role of Computer in Business

The use of computers among maximum practiced in the field of business. In fact, small businesses also use the computer as there are now very cheap microcomputers. Business



organizations now have a number of facts and a lot of numbers to be processed. So many businesses have started using the computer, for example to calculate the salary, to identify the goods sold and are still in stock, to issue and send or receive business statements, letters, invoices and more.

The use of computers and office equipment to assist other managers, clerks, and the management of office automation mentioned. One of them is a word processing type of electronic method that enables us to produce and edit letters, reports, documents, and other than work in a few seconds to type manually. Many of the office to produce standard letters, such as payment of the balance, invitations and more. In addition, local business organizations to use computers to create, save, and send envoys to a particular place. The advantages of using computers in this area, clearly it is very important in a business organization

### **Role of Computers in Banking and Financial**

Processing data involving savings accounts, fixed deposits, loans, investments, profitability analysis, and so on are among the organizations operating budget. The measures used are standard and recurrent. And with that, the financial institution is the first user and is aware of the importance of computers to save time. Use of financial institutions including electronic fund transfer activities for example a bank has a terminal in each branch in the country and also in supermarkets, petrol stations, schools, factories, homes, hotels, and so on.

The company will move employees' salary into the account by entering employee identification numbers then pay the money transferred into the account supermarkets, hotels, or gas station when making a purchase. Money transfer facility is referred to the electronic transfer of money is very effective use is safe and quick method for financial transactions. With the facility, known as ETC is also individual can issue, transfer, and include cash or checks to the current balance at any time. Clearly the main purpose of the use of computer in financial institutions can assist in arranging the affairs of clients and provide services better and more efficient, reduce fraud in financial transactions also eliminate cash transactions involving the community with the goal to create a cashless society.

### **Role of Computers in Industries**

Industry has a lot of benefit from the use of computers and the development of human machine that 'robot'. Industrial production, for example requires a lot of computers to process data collected from employees, customers, sales, product information, production schedules, and so





on. Computer can be used to control the production process. Especially the production of information processing inventory control to keep the latest information about the remaining inventory of raw materials and finished goods used to determine the value of inventory and stock status. This computer can alert the staff involved if he should order the raw materials and when to deliver the goods completed to the customer. Similarly, to store information about the structure of an item, but the material requirement planning processes also use computers to facilitate the work. Appear in the computer industry is very broad and also affect the development of industry in a country.

### **Role of Computers in Education**

Now in this era of science and technology computer becomes more advanced, the computer may take over the role of books in the store and disseminate knowledge to the public. In other words, the computer will change the way we learn and the way we store knowledge. In academics related matters such as student registration, class scheduling, processing of examination results, students 'and teachers' personal storage can be implemented by a computer with a fast and effective in helping the administration. Now exams results were processed by computer. The IPT also the duties of office automation, processing, scientific research results and also use the computer. In fact, cataloging books in libraries also apply to computer use. Last but not least is used for teaching and learning process is not only at institutions of higher learning in the schools, both for teaching and studying computer-assisted education on computer is very emphasized that in the field of education for helping in the administrative process, research is what is important is the ease and help students and teachers in the teaching and learning.

### **Role of Computers in the Medical Field**

Hospitals and clinics use computers to store patient records, scheduling doctors, nurses and other personnel, inventory and purchase of medicines, medical research and medical diagnosis. Applications of computer-based equipment or use of information technology has help doctors to diagnose diseases. It is clear that the use of computers in the medical field to provide solutions to complex problems. Among the new computer technology that provides assistance to those who are disabled. Microprocessor-based voice systems assist people with disabilities speaking with a terminal that directs the computer to perform a verbal task. Similarly, the development of computers has helped the blind to see, the deaf to communicate, whether with the help of speech synthesizer or using the keyboard. This can be help them become more



active and can do what they could not do before. Besides works of traditional data processing, such as issuing bills of patients, medical statistics and scheduling of staff and others have also streamlined and processed by computer.

Hospital Information system that is used can be stored in a centralized patient database. In fact, the use of information technology the computer is programmed to culture and analyze bacteria, viruses, and other infectious agents to automatically detect and identify a disease thus enabling the hospitals and laboratories to begin treatment. For example, Computer helps Demography machine (Computer Aided Demography, CAT) used for the purpose. Similarly, computers are used for a patient oversee psychological variables such as blood pressure, body temperature, ECG (Electro-Cardiograph) and sounded a warning if something unusual happens. For this purpose, the computer to read different variables and make comparison with standard values.

### **Role of Computers in Legal**

Computers have been used in the legislative process in recent years. The use of the most important is the preparation of documents using a word processor. The use of computer accounting legislation also includes processing to produce weekly and monthly reports, keep records of payments consulting, diary for the latest attorney information consumers about the various court procedures and also to keep records of users. As this area is very complicated, it is the need to retrieve the required information either on journal of law, an important case, scale, and statistics or important decisions for the purpose of making the decision to retain legal data bank. Thus, the use of one computer will help lawyers and trainee lawyers and law students find relevant data without wasting time and get better service.

### **Role of Computers in Government**

Government sector is one of the largest users of computer usage practices in implementing administrative matters. All the necessary data can be obtained in a short time such as information about people, services, economic planning, and land development projects and for planning and decision making. Through long-term weather forecasting computer can now be done. With the loss of life, it can be because of better information and faster. The success of Neil Armstrong on July 23, 1969 landing on the moon is also made possible with the help of computers used to design spacecraft, space for clothes astronauts, and flight schedules. This shows the very important use of computers in the field of space transportation. Service tax and income tax collection was simplified by using the computer. Keeping records of taxpayers who



do it manually, and bring many problems have been addressed with the use of computer and services can make the task more efficiently and quickly.

Similarly, in the military, use of computer store inventory held until the war simulation on the screen. Computers are also used to follow the movement of the enemy in the border areas. Traffic flow can be managed effectively by detecting the direction of traffic using the many tools of detection. In this way, if there are more vehicles from one direction, the computer will let the green light goes on for a suitable period of time. Similarly, business owners and vehicle registration can be performed with the use of computers. Many of all administrative affairs are managed by using the computer. This did not only save time but can do all things more practical.

### **Role of Computers in Entertainment**

Now the computer can be programmed to play music. Places of entertainment with music controlled by computer are cheaper and can be used at any time. Computer are also used to arrange the order of dance and music. Each game requires movement. Movement can best be obtained by detailed analysis of a physical system. Computers also can be programmed to depict images of high quality. Drawing using the computer speeds up the process of creating. The work of art can be done and made a review in a short time compared with traditional stories. Cartoon films produced by computers have grown so widely.

### **Role of Computers at Daily Life**

Microcomputer use also home to control the safety and control of air conditioning and lighting. The use of computers in the home allows housewife get the latest information about fashion and can make orders to use supermarket with and video. In addition to budget planning and inventory at home. This is all to do with a microcomputer that is connected to the national data bank. Children can use computers to learn school subjects or educational games. But it is clear that computers have become machines of information in our society.

To conclude, the rapid development of science and technology has changed the pattern of life now. Everything, processing, gathering information, or any aspects of the various areas that were previously done manually, which gives a lot of risk has to be made more effective, faster, and more practical with the application or use of information technology or computer. Covering the use in various fields including business, financial institutions, industry, education, administration and other fields have the desire to realize develop each country. The fact is,





computers have become the heart and backbone of society today. Whatever the field, computing has a lot of people taken over the task. It will not only help in the calculations, store information, detect a decision also to increase efficiency and productivity.

## **HISTORY OF COMPUTING**

Before computers were developed people used sticks, stones, and bones as counting tools. The evolution of computer has passed through different stages before it reached the present state of development. The evolution probably started from 3500BC when human being first started to learn to calculate with a calculating machine named Abacus. Thus, the evolution of counting system from abacus to modern Microcomputer is the result of continuous human effort in search of a more versatile and efficient machine.

### **KEY MILESTONE IN COMPUTER HISTORY**

#### **ABACUS**

Abacus seems to be the earliest calculating machine which was developed by the Chinese and it is believed to be the first computer. Abacus consist wooden rack that has metal rods with beads which can move, in wires. The wire represented the column. The right most column represented the unit, the next for ten and so on. Numbers were represented by moving the beads at appropriate column. Abacus could perform simple addition and subtraction.

#### **Napier's Bones**

Napier's Bones was a manually operated calculating device and as the name indicates, it was invented by John Napier. In this device, he used 9 different ivory strips (bones) marked with numbers to multiply and divide for calculation. It was also the first machine to use the decimal point system for calculation.

#### **Pascal Mechanical Calculator**

Blaise Pascal, the French mathematician, laid the foundation of automatic computing. Blaise Pascal used his adding machine (1662) simply for addition and subtraction. The machine consisted of gears, wheels and dials. With this, calculation could be performed by dialing these series of wheels carrying the number 0 to 9 around their circumference. The wheel was



arranged in such a manner that each wheel had 10 segment and when a wheel completed one rotation the next wheel would move by one segment. This machine was later improved by Gottfried (Germany) to perform multiplication and division

### **Charles Babbage's Differential Engine**

Charles Babbage, a professor of mathematics at Cambridge University, invented a machine called Differential Engine which could evaluate accurately algebraic expressions and mathematical tables – correct up to 20 decimal places. Later, he developed analytical machine, which could perform addition at the rate of 60 per minute.

### **Analytical Engine**

Charles Babbage developed another calculating machine in 1830 which was Analytical Engine. Analytical Engine was a mechanical computer that used punch cards as input. It was capable of performing or solving any mathematical problem and storing information as a permanent memory (storage).

### **Tabulating Machine**

Herman Hollerith, an American statistician invented this machine in the year 1890. Tabulating Machine was a mechanical tabulator that was based on punch cards. It was capable of tabulating statistics and record or sort data or information. This machine was used by U.S. Census in the year 1890. Hollerith's Tabulating Machine Company was started by Hollerith and this company later became International Business Machine (IBM) in the year 1924.

### **Differential Analyzer**

Differential Analyzer was the first electronic computer introduced in the year 1930 in the United States. It was basically an analog device that was invented by Vannevar Bush. This machine consists of vacuum tubes to switch electrical signals to perform calculations. It was capable of doing 25 calculations in a few minutes.

### **Mark I – Electro Mechanical Computer**

In 1934, Harvard professor H Eiken developed an automatic calculating machine, which was called Mark -I digital computer. Its internal operation was automatically controlled. In the year



1944, Mark I computer was built as a partnership between IBM and Harvard. It was also the first programmable digital computer marking a new era in the computer world.

The basic drawback of the mechanical and electromechanical computer was:

- The speed was limited due to the friction/ inertia generated by the movement of components
- The data movement was quite difficult and unreliable.

## **GENERATIONS OF COMPUTERS**

### **First Generation Computers**

In the period of the year 1940-1956, it was referred to as the period of the first generation of computers. These machines are slow, huge, and expensive. In this generation of computers, vacuum tubes were used as the basic components of CPU and memory. Also, they were mainly dependent on the batch operating systems and punch cards. Magnetic tape and paper tape were used as output and input devices. For examples ENIAC, UNIVAC-1, EDVAC, etc.

### **Second Generation Computers**

In the period of the year, 1957-1963 was referred to as the period of the second generation of computers. It was the time of the transistor computers. In the second generation of computers, transistors (which were cheap in cost) are used. Transistors are also compact and consume less power. Transistor computers are faster than first-generation computers. For primary memory, magnetic cores were used, and for secondary memory magnetic disc and tapes for storage purposes. In second-generation computers, COBOL and FORTRAN are used as Assembly language and programming languages, and Batch processing and multiprogramming operating systems were used in these computers.

For example, IBM 1620, IBM 7094, CDC 1604, CDC 3600, etc.

### **Third Generation Computers**

In the third generation of computers, integrated circuits (ICs) were used instead of transistors (in the second generation). A single IC consists of many transistors which increased the power of a computer and also reduced the cost. The third-generation computers are more reliable, efficient, and smaller in size. It used remote processing, time-



sharing, and multiprogramming as operating systems. FORTRAN-II TO IV, COBOL, and PASCAL PL/1 were used which are high-level programming languages.

For example, IBM-360 series, Honeywell-6000 series, IBM-370/168, etc.

### **Fourth Generation Computers**

The period of 1971-1980 was mainly the time of fourth generation computers. It used VLSI (Very Large Scale Integrated) circuits. VLSI is a chip containing millions of transistors and other circuit elements and because of these chips, the computers of this generation are more compact, powerful, fast, and affordable (low in cost). Real-time, time-sharing and distributed operating system are used by these computers. C and C++ are used as the programming languages in this generation of computers.

For examples STAR 1000, PDP 11, CRAY-1, CRAY-X-MP, etc.

### **Fifth Generation Computers**

From 1980 – to till date these computers are used. The ULSI (Ultra Large-Scale Integration) technology is used in fifth-generation computers instead of the VLSI technology of fourth-generation computers. Microprocessor chips with ten million electronic components are used in these computers. Parallel processing hardware and AI (Artificial Intelligence) software are also used in fifth-generation computers. The programming languages like C, C++, Java, .Net, etc. are used.

For examples Desktop, Laptop, NoteBook, UltraBook, etc.

## **OVERVIEW OF COMPUTER SYSTEMS**

A computer system primarily comprises a central processing unit (CPU), memory, input/output devices and storage devices. All these components function together as a single unit to deliver the desired output. A computer system comes in various forms and sizes. It can vary from a high-end server to personal desktop, laptop, tablet computer, or a smartphone.

## **HARDWARE AND SOFTWARE COMPONENT**



**Hardware** refers to the physical components of a computer. Computer Hardware is any part of the computer that we can touch these parts. These are the primary electronic devices used to build up the computer. Examples of hardware in a computer are the Processor, Memory Devices, Monitor, Printer, Keyboard, Mouse, and Central Processing unit.

**Software** is a collection of instructions, procedures, and documentation that performs different tasks on a computer system. We can say also Computer Software is a programming code executed on a computer processor. The code can be machine-level code or code written for an operating system.

Examples of software are MS- Word, Excel, PowerPoint, Google Chrome, Photoshop, MySQL, etc.

### INPUT, OUTPUT AND STORAGE DEVICE

- **Input Devices:** The devices through which control signals are sent to a computer are termed as input devices. These devices convert the input data into a digital form that is acceptable by the computer system. Some examples of input devices include keyboard, mouse, scanner, touch screen, etc., Specially designed braille keyboards are also available to help the visually impaired for entering data into a computer. Besides, we can now enter data through voice, for example, we can use Google voice search to search the web where we can input the search string through our voice. Data entered through input device is temporarily stored in the main memory (also called RAM) of the computer system. For permanent storage and future use, the data as well as instructions are stored permanently in additional storage locations called secondary memory

- **Output Devices:**

The device that receives data from a computer system for display, physical production, etc., is called output device. It converts digital information into human understandable form. For example, monitor, projector, headphone, speaker, printer, etc. Some output devices are A braille display monitor is useful for a visually challenged person to understand the textual output generated by computers. A printer is the most commonly used device to get output in physical (hardcopy) form. Three types of commonly used printers are inkjet, laserjet and dot matrix. Now-a-days, there is a new type of printer called 3D-printer, which is used to build physical replica of a digital 3D design. These



printers are being used in manufacturing industries to create prototypes of products. Their usage is also being explored in the medical field, particularly for developing body organs.

- **Storage Devices:** Storage Devices are devices that are used for storing data and they are also known as Secondary Storage Data. Examples of Storage Devices are CDs, DVDs, Hard Disks, etc. Storage devices are the computer hardware used to remember/store data. Storage devices will store data, even when the power to the computer is switched off. When the power is switched on again, the data can be retrieved. Storage devices are known as 'non-volatile'.

## SUMMARY

Introduction to Computer Science explores the fundamental principles of computation and information processing. It covers algorithms, the step-by-step procedures that solve problems, and data structures, the organized methods of storing and managing data.

The field delves into programming languages, the tools used to instruct computers, and software development, the process of creating applications. Computer architecture, which examines how computers function, is also a core component.

Furthermore, it introduces theoretical concepts like computational complexity and automata theory, which explore the limits and capabilities of computation. Practical applications span from web development and database management to artificial intelligence and cybersecurity. Computer science provides the foundation for understanding and shaping the digital world.

## EVALUATION QUESTION

1. Define what is a computer with the importance
2. Discuss the key milestone in computer history
3. Explain the generations of Computer
4. Differentiate between Hardware and Software component

## ANSWER

1. Define what is a computer with the importance





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## **2. Discuss the key milestone in computer history\**

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