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Introduction to Computer



**BASIC
CONCEPTS**



**HARDWARE
& SOFTWARE**



**INTERNET
& NETWORKING**



**FILE
MANAGEMENT**

Definition of Computer

A computer is an electronic, programmable device that accepts raw data as input, processes it according to a set of instructions (program), stores data and information, and produces meaningful results as output.

The word Computer is derived from the Latin word Computare, meaning "**to calculate or count.**"

A computer works on the principle of IPO (Input–Process–Output).

Basic working principle of a computer

Example: When a user enters two numbers, 20 and 30, the computer processes them using an addition program and displays 50 as the result.

Characteristics of Computer

1. **Speed:** Performs millions or billions of operations per second.
2. **Accuracy:** Produces accurate results when the data, instructions and hardware function correctly.
3. **Diligence:** Can perform repetitive tasks without tiredness.
4. **Storage:** Stores large amounts of data for future use.
5. **Versatility:** Performs different types of tasks.
6. **Automation:** Executes instructions automatically after initiation.
7. **Reliability:** Produces consistent results under proper operating conditions.
8. **Multitasking:** Supports multiple tasks through operating-system scheduling.

Limitations of Computer

- Cannot independently exercise human judgment or common sense.
- Depends on hardware, software, electricity and appropriate instructions.
- Incorrect input or programming can produce incorrect results (GIGO — Garbage In, Garbage Out).
- Does not possess human emotions or consciousness.

History of Computer

The development of computers began with manual calculating devices and gradually progressed to mechanical, electromechanical and electronic systems.

The history of computing spans several centuries.

Abacus (Ancient period)

One of the earliest known calculating devices, used for arithmetic operations such as addition and subtraction.

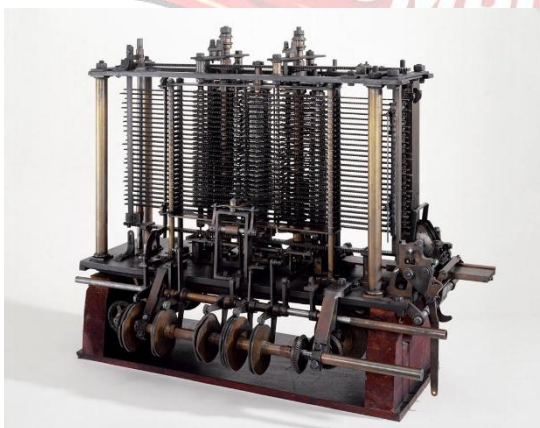
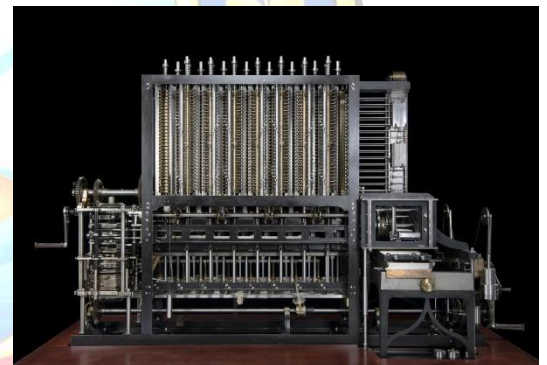


Pascaline (1642)

Invented by Blaise Pascal. A mechanical calculator primarily designed for addition and subtraction.

Difference Engine (1822)

Designed by Charles Babbage to calculate mathematical tables using mechanical components.

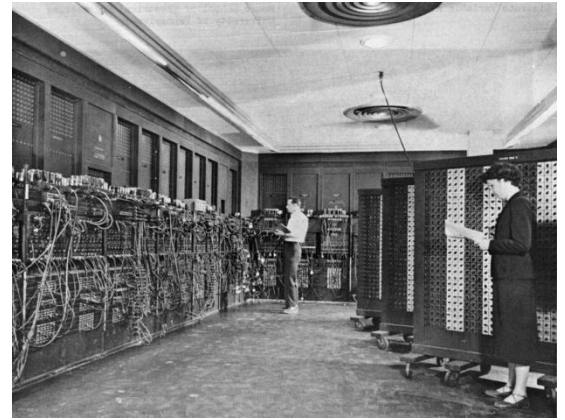


Analytical Engine (1837)

Designed by Charles Babbage. It introduced concepts similar to modern computer architecture, including processing, memory, input and output.

ENIAC (1945–1946)

Developed by J. Presper Eckert and John Mauchly. One of the earliest general-purpose electronic digital computers, publicly unveiled in 1946.



Inventors and Pioneers of Computer



Charles Babbage (1791–1871)

Known as the Father of the Computer because of his designs for the Difference Engine and Analytical Engine.



Ada Lovelace (1815–1852)

Often called the first computer programmer for her published algorithm intended for Babbage's Analytical Engine.



Alan Turing (1912–1954)

A pioneer of theoretical computer science who introduced the concept of the Turing machine in 1936.



John von Neumann (1903–1957)

Associated with the stored-program architecture used as a foundation for many modern computers.

Important Historical Facts

Question	Answer
Father of Computer	Charles Babbage
First computer programmer	Ada Lovelace
Inventor of Pascaline	Blaise Pascal
Inventor of Tabulating Machine	Herman Hollerith
ENIAC developers	Eckert and Mauchly
Father of theoretical computer science	Alan Turing
First widely recognized commercial computer in the USA	UNIVAC I (1951)
First generation technology	Vacuum tubes

Architecture of Computer

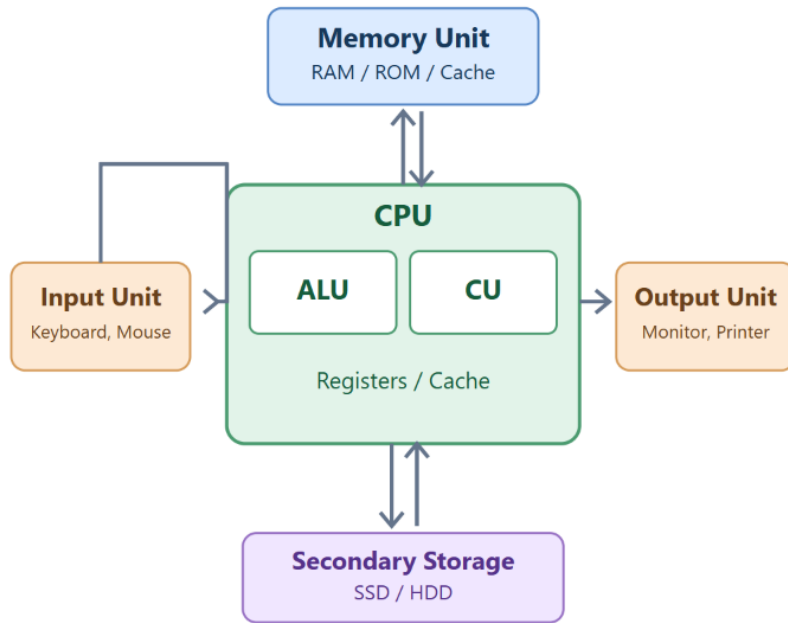
Computer architecture describes the design, organization and interaction of a computer's major components.

The basic functional units of a computer are:

1. Input Unit
2. Central Processing Unit (CPU)
3. Memory Unit
4. Output Unit
5. Secondary Storage Unit

Block Diagram of Computer Architecture

Simplified functional block diagram of a computer system



4.1 Input Unit

The input unit receives data and instructions from users and converts them into a form suitable for computer processing.

Examples: Keyboard, mouse, scanner, microphone, webcam, barcode reader and touchscreen.

4.2 Central Processing Unit (CPU)

The CPU is commonly called the brain of the computer because it executes program instructions and controls processing activities.

Its major components include:

A. Arithmetic Logic Unit (ALU)

Performs arithmetic and logical operations.

- Arithmetic: Addition, subtraction, multiplication and division.
- Logical: Comparisons such as greater than, less than and equal to.
- Bitwise operations: AND, OR, NOT and XOR.

B. Control Unit (CU)

Coordinates the operations of the computer. It controls the flow of instructions and data among the CPU, memory and input/output devices.

C. Registers

Very small, high-speed storage locations inside the CPU used to temporarily hold data, instructions and addresses.

4.3 Memory Unit

Memory stores data, instructions and intermediate results.

Primary Memory Secondary Storage

RAM HDD

ROM SSD

Cache Memory USB Flash Drive

RAM is generally volatile, while ROM and secondary storage retain their contents without continuous power.

4.4 Output Unit

The output unit presents processed information in a human-readable or machine-usable form.

Examples: Monitor, printer, speaker, projector and plotter.

4.5 Working of CPU — Instruction Cycle

The CPU generally processes instructions using the Fetch–Decode–Execute cycle.

5. Types of Computers

Computers can be classified on the basis of data handling, size, processing capability and purpose.

5.1 Based on Data Handling

Analog Computer

Works with continuously varying physical quantities such as voltage, temperature or pressure. Historically used in scientific simulation and measurement.



Digital Computer

Processes discrete data represented using binary digits (0 and 1). Examples include desktops, laptops and smartphones.



Hybrid Computer

Combines analog and digital computing techniques. Used in certain specialized measurement, control and scientific systems.



Based on Size and Processing Capacity

Microcomputer

Generally a personal computer based on a microprocessor. Examples: desktop, laptop and some embedded computing devices.



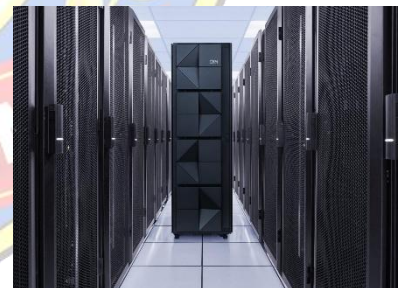
Minicomputer

A historical category of midrange computers, more powerful than early microcomputers and smaller than traditional mainframes. Example: PDP-11.



Mainframe Computer

Large systems designed for reliable, high-volume transaction processing and supporting many concurrent users. Used in banking and enterprise systems.



Supercomputer

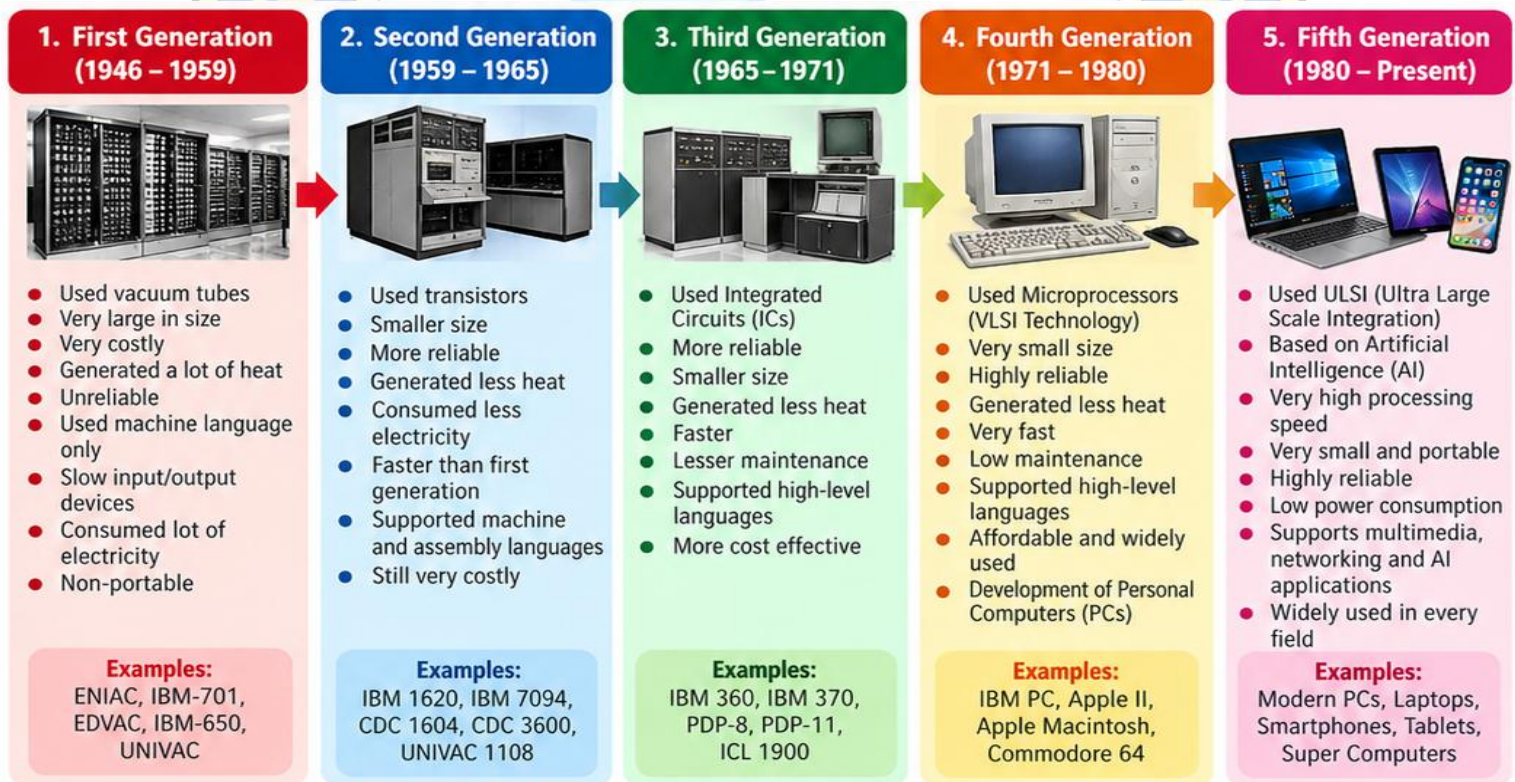
A very high-performance computer designed for computationally intensive scientific and engineering problems, such as weather forecasting, molecular simulation and climate modelling.



Comparison of Computer Types

Type	Major Feature	Common Application
Analog	Continuous signals	Simulation and measurement
Digital	Binary processing	Education, office, business
Hybrid	Analog + digital	Specialized control systems
Microcomputer	Personal computing	Home and office
Minicomputer	Historical midrange category	Departmental computing
Mainframe	High-volume transactions	Banking and enterprises
Supercomputer	Very high computational power	Scientific research

Generations of Computers



Application of Computer

1. Business  - Accounting and billing - Inventory management - Data analysis - Communication	2. Banking  - Online banking - ATM services - Fund transfers - Customer record management	3. Education  - Online learning - Digital classrooms - Research and projects - Examinations and result processing	4. Marketing  - Market research - Advertising - Sales analysis - Customer database management	5. Health Care (Medical)  - Patient record management - Disease diagnosis - Medical research - Telemedicine - Hospital management
6. Military (Defence)  - Weapon control systems - Simulation and training - Surveillance and security - Communication systems	7. Entertainment  - Movies and animation - Music and gaming - Graphics and video editing - Virtual reality (VR)	8. Railway  - Reservation systems - Ticketing - Train schedule management - Passenger information systems	9. Science & Research  - Scientific calculations - Space research - Weather forecasting - Data analysis and simulation	10. Home & Personal Use  - Internet browsing - Online shopping - Video calling - Storing photos and documents - Smart home applications

Common IT Gadgets and Their Applications

1. Smartphone

A smartphone is a portable device that combines mobile communication with computing capabilities.

Applications: Voice and video calls, internet browsing, email, online banking, GPS navigation, digital payments, photography and online learning.

Technologies: Android/iOS, GPS, Wi-Fi, Bluetooth, NFC and mobile networks.



2 Laptop

A laptop is a portable personal computer with an integrated screen, keyboard, touchpad and rechargeable battery.

Applications: Programming, office work, presentations, online classes, graphic designing, data analysis and video editing.



Key Feature: Provides desktop-like computing capabilities in a portable form.

3 Tablet

A tablet is a portable touchscreen computer, generally larger than a smartphone.

Applications: Reading e-books, digital note-taking, drawing, video conferencing, online education, entertainment and business presentations.

Key Feature: Touchscreen operation, often with optional stylus support.



4 Smartwatch

A smartwatch is a wearable digital device that provides timekeeping, notifications and smart functions.

Applications: Fitness tracking, step counting, heart-rate monitoring, notifications, navigation and contactless payments on supported models.

Key Feature: Uses sensors such as accelerometers and optical heart-rate sensors.



5 Fitness Band

A fitness band is a wearable gadget designed mainly to monitor physical activity.

Applications: Counting steps, tracking workouts, estimating calories burned and monitoring sleep patterns.

Key Feature: Generally lightweight with long battery life.



6 Smart TV

A Smart TV is a television with built-in computing capabilities and internet connectivity.

Applications: Streaming videos, browsing supported online content, educational programs, video calling on compatible devices and screen mirroring.



Technologies: Wi-Fi, HDMI, Bluetooth and smart TV operating systems.

7 Smart Speaker

A smart speaker is an internet-connected audio device that often includes a voice assistant.

Applications: Playing music, setting reminders, answering questions, controlling compatible smart-home devices and providing weather information.

Examples: Amazon Echo and Google Nest speakers.



8 Digital Camera

A digital camera captures photographs and videos using an electronic image sensor.

Applications: Photography, filmmaking, journalism, surveillance, scientific imaging and content creation.

Technologies: CMOS/CCD sensors, digital image processing and memory cards.



9 Virtual Reality (VR) Headset

A VR headset creates an immersive computer-generated environment.

Applications: Virtual training, gaming, education, architectural visualization, medical simulation and industrial training.

Key Feature: Uses displays and motion tracking to create an immersive experience.



10 Drone

A drone is an unmanned aerial vehicle (UAV) that can be remotely controlled or operate with varying degrees of automation.



Applications: Aerial photography, agriculture, land surveying, inspection, mapping, disaster assessment and delivery trials.

Technologies: GPS/GNSS, cameras, wireless communication and flight controllers.

Other Important IT Gadgets

Scanner: Converts printed documents and photographs into digital images. Used for document digitization and archiving.



Printer: Produces hard copies of documents and images. Common types include inkjet and laser printers.



External SSD/HDD: Used for data backup, portable storage and transferring large files.



Wi-Fi Router: Connects devices within a network and routes data between networks, often providing internet access.



USB Flash Drive: A portable flash-memory device used for file transfer and storage.



IP/CCTV Camera: Used for surveillance, remote monitoring and security recording.

securityvue
SMARTHOME
IP Camera
With Pan & Tilt



1 YEAR
WARRANTY



Biometric Device: Uses fingerprints, facial features or other biometric characteristics for identification or verification.

E-Book Reader: A digital reading device, often using an E-Ink display, designed for reading electronic books.



Classification of IT Gadgets

IT gadgets can be classified according to their main functions.

Category	Examples
Communication	Smartphone, smart speaker
Computing	Laptop, tablet, mini PC
Wearable	Smartwatch, fitness band
Entertainment	Smart TV, gaming console, VR headset
Storage	Pen drive, external SSD, memory card
Networking	Router, modem, wireless access point
Security	CCTV camera, biometric device
Imaging	Digital camera, webcam, scanner
Smart Home	Smart bulb, smart plug, smart thermostat

Applications of IT Gadgets in Different Fields

- Education
- Healthcare
- Banking and Finance
- Business and Offices
- Agriculture
- Security and Surveillance

Technologies Used in Modern IT Gadgets

Technology	Full Form / Meaning	Application
Wi-Fi	Wireless networking technology	Internet and local networking
Bluetooth	Short-range wireless communication	Earbuds, keyboards, wearables
GPS	Global Positioning System	Location and navigation
NFC	Near Field Communication	Contactless payments
RFID	Radio Frequency Identification	Identification and tracking
IoT	Internet of Things	Connected smart devices
AI	Artificial Intelligence	Voice assistants and intelligent features
USB	Universal Serial Bus	Data transfer and charging
QR Code	Quick Response Code	Information access and payments
5G	Fifth-generation mobile network technology	High-speed mobile connectivity

Introduction to Hardware and Software

A computer system consists of two essential components: Hardware and Software. Both work together to perform computing tasks.

- **Hardware:** The physical components of a computer that can be seen and touched.
- **Software:** A collection of programs, instructions and related data that directs the computer to perform specific tasks.

Example: When typing a document, the keyboard and monitor are hardware, while Microsoft Word or LibreOffice Writer is software.



Computer Hardware

Computer Software

Computer Hardware

Computer hardware refers to all physical and electronic components that make up a computer system.

Hardware components perform functions such as accepting input, processing data, storing information and displaying output.

Classification of Hardware

Hardware can be classified into five major categories:

1. Input Devices
2. Output Devices
3. Processing Devices
4. Storage Devices
5. Communication Devices

Input Devices

Input devices are hardware components used to enter data and instructions into a computer.

Keyboard: Used to enter text, numbers, symbols and commands into a computer.



Mouse: A **pointing device** used to select, click, drag and interact with graphical elements.



Scanner: Converts printed documents and photographs into digital images.



Webcam: Captures digital images and videos for video calls, online meetings and recording.



Microphone: Converts sound into electrical signals that can be digitized for recording or communication.



Other Examples: Joystick, barcode reader, OCR scanner, OMR reader, MICR reader, graphics tablet and biometric scanner.

Output Devices

Output devices present processed information to users in visual, printed or audio form.

Monitor (VDU): Displays text, graphics, images and videos. Common display technologies include LCD and OLED.



Printer: Produces hard copies of documents and images. Common types include inkjet and laser printers.



Speaker: Converts digital audio signals into audible sound.



Projector: Displays computer-generated images and presentations on a large screen.



Other Examples: Plotter, headphones, braille display and 3D printer.

Processing Devices

Processing devices execute instructions and perform calculations.

Central Processing Unit (CPU)

The CPU is commonly known as the brain of the computer. It executes program instructions, performs calculations and coordinates processing operations.



Major components of a CPU:

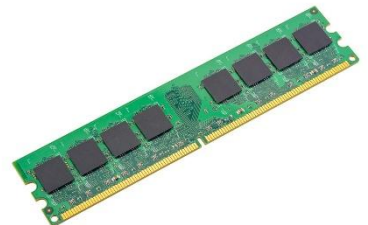
- Arithmetic Logic Unit (ALU): Performs arithmetic and logical operations.
- Control Unit (CU): Coordinates and controls the execution of instructions.
- Registers: Small, high-speed storage locations within the CPU.

Other processing hardware includes Graphics Processing Units (GPUs), Digital Signal Processors (DSPs) and specialized AI accelerators.

a. Storage Devices

Storage devices are used to retain data, instructions and information.

RAM — Temporary working memory



HDD — Magnetic data storage



SSD — Flash-based storage



Pen Drive — Portable storage



Primary Memory: Includes RAM, ROM and cache memory.

Secondary Storage: Includes HDD, SSD, optical discs, USB flash drives and memory cards.

2.6 Communication Devices

Communication devices enable computers to exchange information over networks.

Device	Main Function
Network Interface Card (NIC)	Connects a computer to a network
Modem	Modulates and demodulates signals for supported communication systems
Router	Forwards data between different networks
Switch	Connects devices within a local area network
Wireless Access Point	Provides wireless network connectivity

3. Computer Software

Computer software is a set of programs, procedures and associated data that instructs computer hardware to perform tasks.

Software is intangible, meaning it cannot be physically touched like hardware.

Examples include Windows, Linux, Android, MS Word, LibreOffice Writer, Google Chrome and Python programs.

3.1 Classification of Software

Common educational classification of computer software

Software is commonly divided into System Software and Application Software.

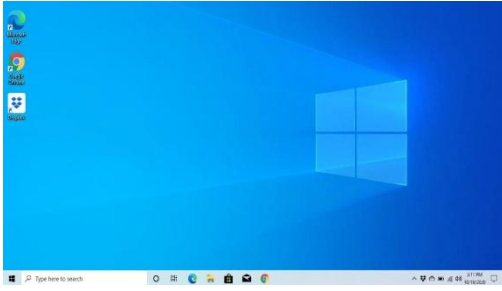
Programming software is also frequently presented as a separate category, although its tools can be considered system or application software depending on the classification.

4. System Software

System software manages computer resources and provides a platform for application programs.

4.1 Operating System (OS)

An operating system is system software that manages hardware, software resources and interactions between users and the computer.



Examples: Microsoft Windows, Linux, macOS, Android and iOS.

Main Functions:

1. Process Management — manages running programs.
2. Memory Management — allocates and manages memory.
3. File Management — organizes files and folders.
4. Device Management — controls input and output devices.
5. Security Management — manages access and permissions.
6. User Interface — provides GUI or command-line interaction.

4.2 Device Drivers

A device driver is software that enables an operating system to communicate with and control a hardware device.

Examples: Printer driver, graphics driver, audio driver and network adapter driver.

4.3 Utility Software

Utility software helps maintain, protect, optimize and manage computer systems.

Examples:

- Antivirus and anti-malware tools
- Disk cleanup utilities
- Backup and recovery software
- File compression utilities
- Disk management tools

4.4 Language Translators

Language translators convert source code into a form that can be executed or processed by a computer.

Translator Description

Assembler Converts assembly language into machine code

Compiler Translates source code into another form, often machine code or intermediate code

Interpreter Executes or evaluates program instructions through an interpretation process

5. Application Software

Application software is designed to help users perform specific tasks such as writing documents, calculations, communication, designing and entertainment.

5.1 General-Purpose Application Software

Software designed for commonly performed tasks.

Software Category	Examples	Application
Word Processor	MS Word, LibreOffice Writer	Document creation
Spreadsheet	MS Excel, LibreOffice Calc	Calculations and analysis
Presentation	PowerPoint, Impress	Slide presentations
Web Browser	Chrome, Firefox	Accessing websites
Graphics Software	GIMP, Photoshop	Image editing
Media Player	VLC Media Player	Playing audio and video

5.2 Special-Purpose Application Software

Software developed to perform particular tasks or meet specific organizational requirements.

Examples:

- Railway reservation software
- Hospital management systems
- School management software
- Payroll management systems

- Banking applications
- Inventory management systems

5.3 Customized Software

Customized software is developed or modified according to the requirements of a particular user or organization.

Example: A computer institute's custom student admission, examination and fee management system.

6. Programming Software

Programming software provides tools for creating, testing, debugging and maintaining computer programs.

Common Tools:

- Code Editor: Used to write and edit source code, such as Visual Studio Code.
- Compiler: Translates programming languages into executable or intermediate forms.
- Interpreter: Executes or evaluates code.
- Debugger: Helps identify and correct programming errors.
- IDE (Integrated Development Environment): Combines editing, execution and debugging tools.

Examples of IDEs: Visual Studio, PyCharm, Eclipse and NetBeans.

7. Firmware

Firmware is software stored in non-volatile memory that provides low-level control and functionality for hardware devices.

It acts as a bridge between hardware and higher-level software in many systems.

Examples:

- BIOS and UEFI firmware
- Router firmware
- Printer firmware
- Embedded controller firmware
- Smart TV firmware

Firmware can often be updated to fix problems, improve security or add features.

8. Difference Between Hardware and Software

Basis	Hardware	Software
Meaning	Physical components	Programs and instructions
Nature	Tangible	Intangible
Creation	Manufactured	Developed/programmed
Examples	CPU, keyboard, monitor	Windows, MS Word
Damage	Can suffer physical damage	Can become corrupted
Replacement	Requires physical repair/replacement	Can often be reinstalled
Function	Performs physical operations	Directs hardware operations

9. Difference Between System Software and Application Software

System Software	Application Software
Manages hardware and system resources	Performs user-oriented tasks
Provides an execution environment	Runs within a supported environment
Often operates in the background	Usually interacts directly with users
Examples: Windows, Linux, drivers	Examples: Word, Excel, Chrome
Essential for general system operation	Installed according to user requirements

10. Relationship Between Hardware and Software

Hardware and software are interdependent in a functional computer system.

Simplified interaction between users, software and hardware

Example: Printing a Document

1. The user prepares a document using MS Word.
2. The application sends a print request through the operating system.
3. The operating system and printer driver prepare and transmit the print data.
4. The printer hardware produces the document on paper.

This demonstrates how hardware and software work together.

11. Software Licensing and Distribution

Software can also be classified according to its licensing and distribution model.

Type	Description	Examples
Proprietary	Source code and usage rights controlled by the owner	Microsoft Windows
Open Source	Source code available under a license permitting specified use and modification	Linux, LibreOffice
Freeware	Available for use without a purchase fee, subject to license terms	Adobe Acrobat Reader
Shareware	Distributed for evaluation or limited use	Trial software
Commercial	Distributed as part of a commercial offering	Microsoft Office
Public Domain	Not subject to copyright restrictions	Public-domain programs

