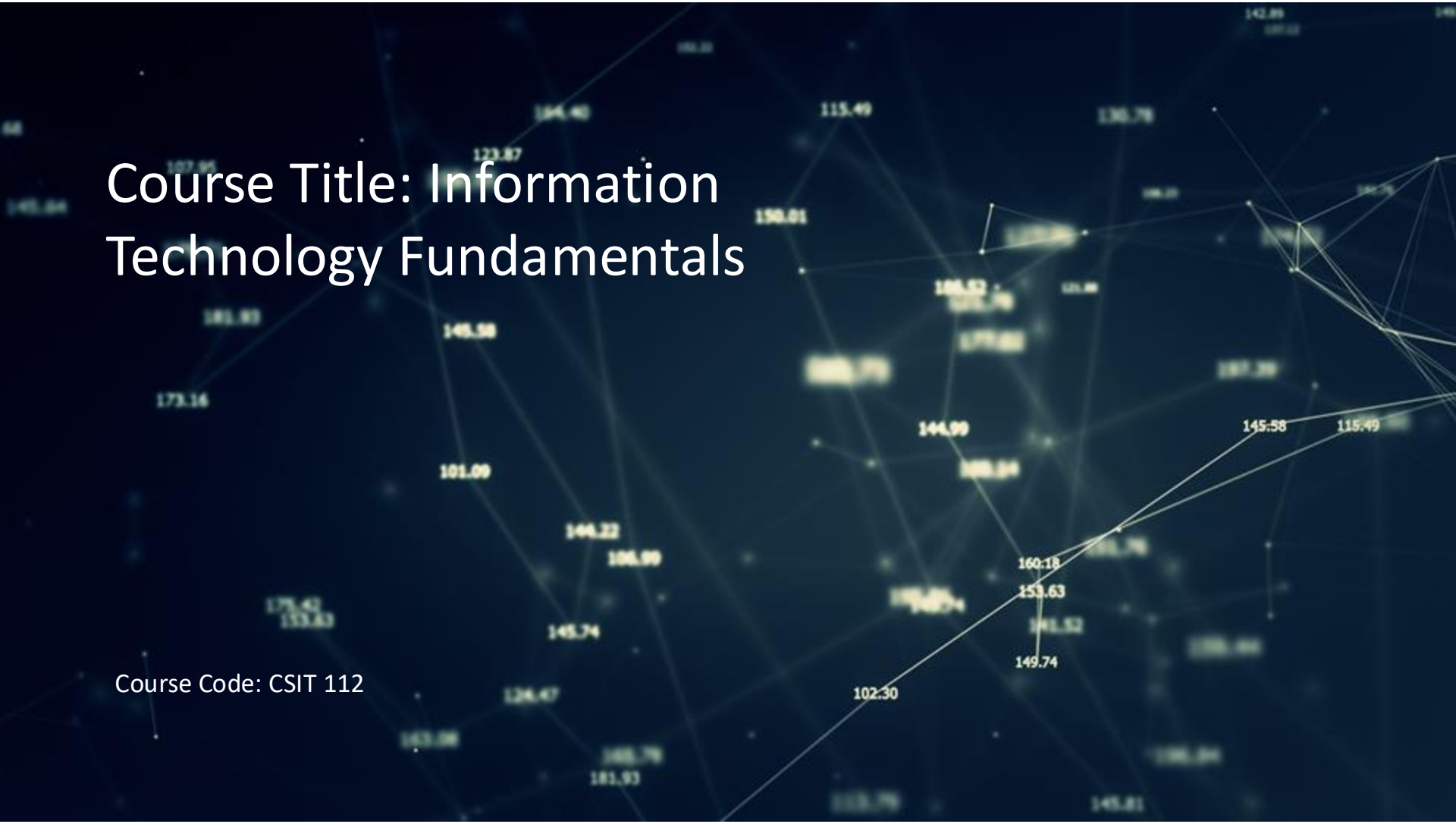
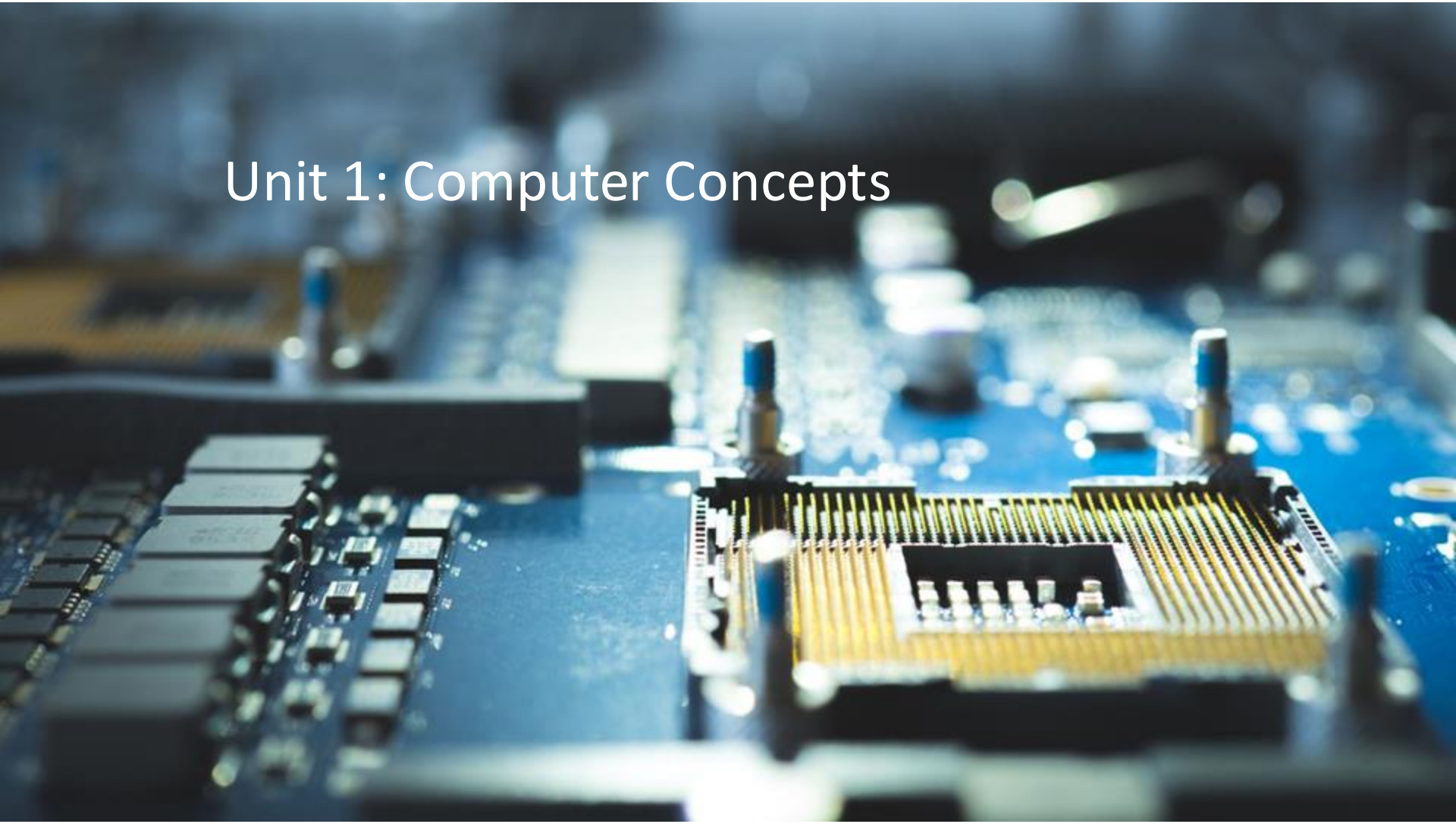


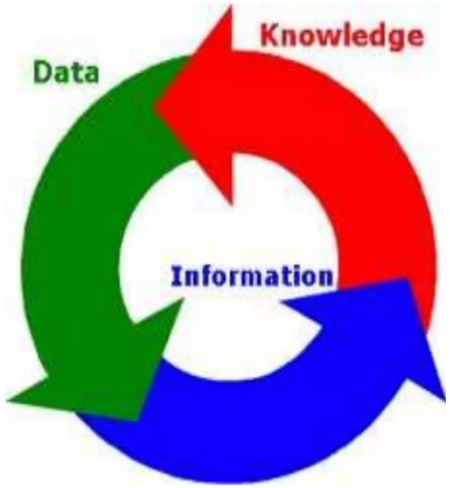
Course Title: Information Technology Fundamentals

Course Code: CSIT 112


Unit 1: Computer Concepts

Information

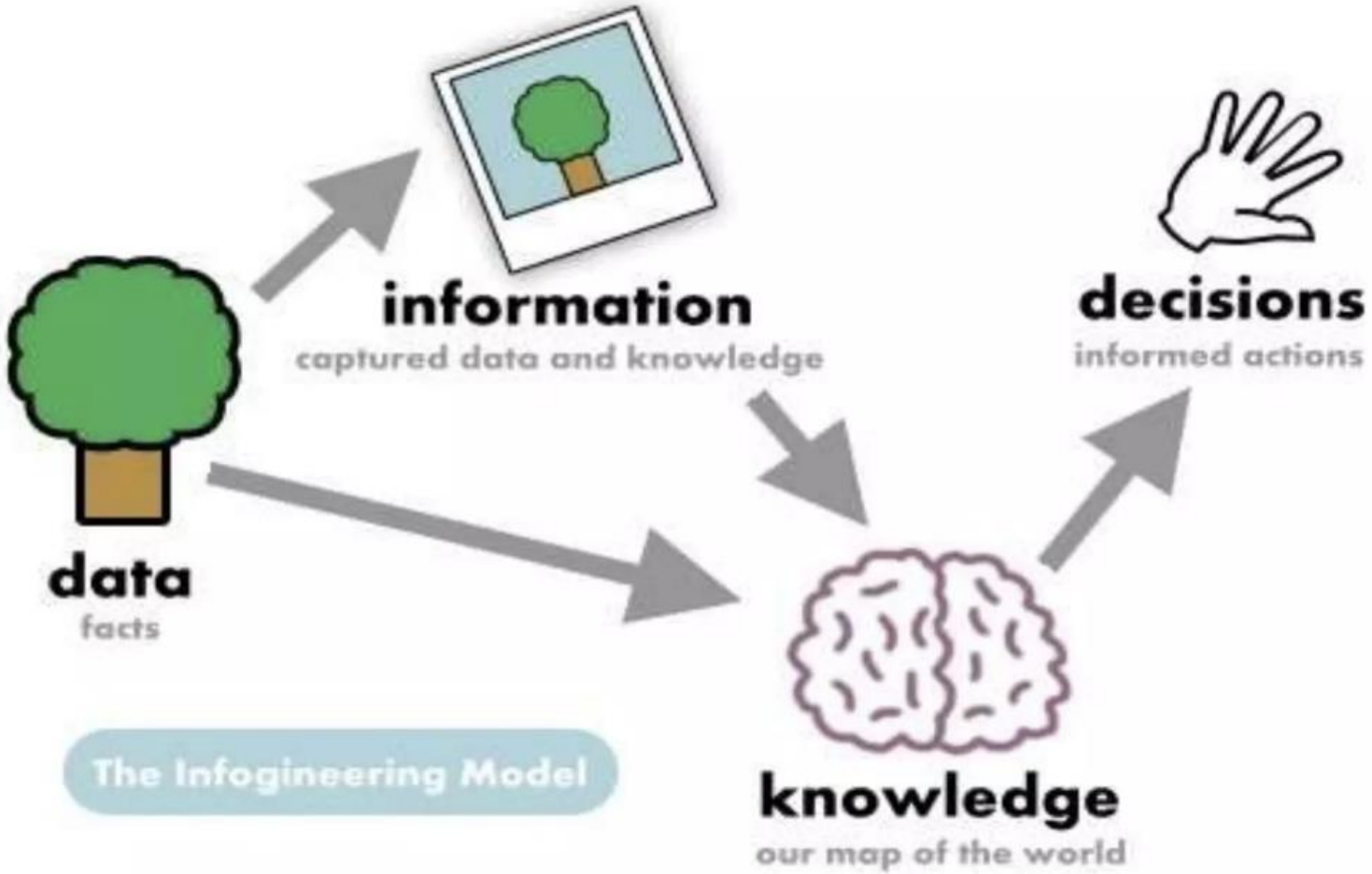
- Its derived from **Latin** word "***informatio***".
- **Information** (shortened as **info** or **info.**) is that which informs, i.e. an answer to a question.
- From which **knowledge** and **data** can be derived.



What is Data and Information?

- Data: Raw, unprocessed facts. Example: Temperature readings, customer names.
- Information: Processed data that is meaningful. Example: Average temperature of a week, sales report. (i.e., reports, trends).
- Data becomes Information through processing.

Why we need information?



Information Technology

- **Information technology** (**IT**) is the application of **computers** and **telecommunications equipment** to **store, retrieve, transmit and manipulate data.**

What is Computer?

- A **computer** is a general-purpose electronic device that can be programmed to carry out a set of arithmetic or logical operations automatically.

Major components of computer

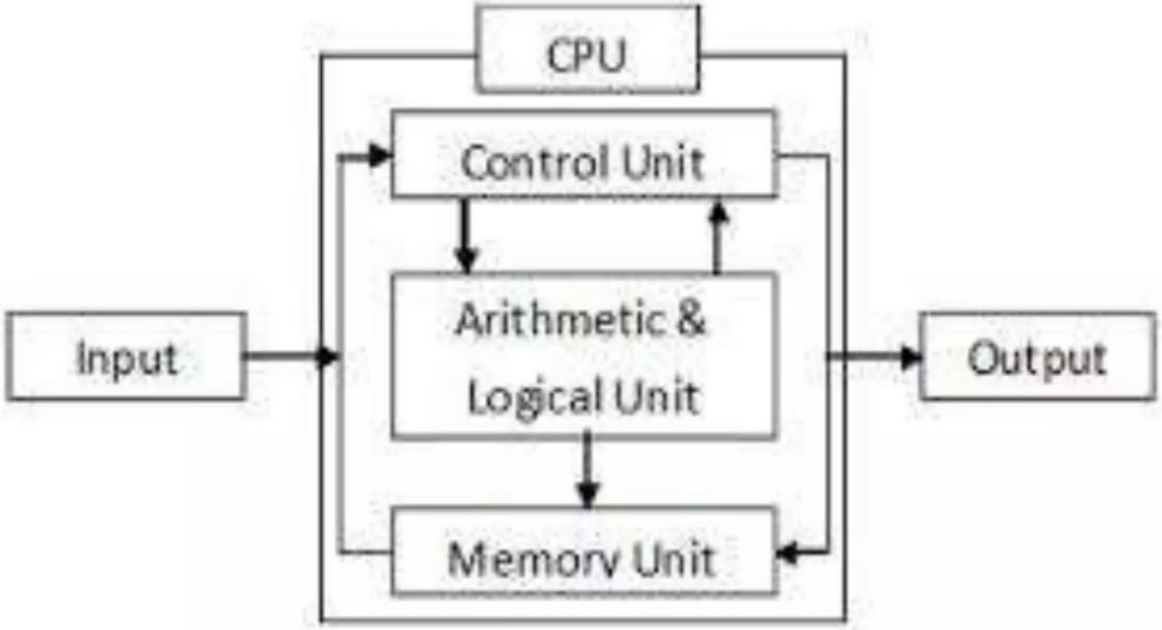


Fig. Block Diagram of Computer

Major components of computer

All general-purpose computers require the following hardware components:

- **Memory:** Enables a computer to **store data and program.** Common mass storage devices include disk drives and tape drives.
- **Input device:** The input device is through which data and instructions enter into a computer. Usually keyboard and mouse.
- **Output device:** Output device lets you see what the computer has accomplished. Usually a display screen, printer etc.
- **Central processing unit (CPU):** The heart of the computer, this is the component that actually process data and executes instructions.

Processing Cycle

- 1. Input: Collecting raw data (e.g., typing text).
- 2. Processing: Converting data into information (e.g., calculations).
- 3. Output: Presenting processed data (e.g., reports).
- 4. Storage: Saving data for future use.

Hardware vs. Software

- Hardware: Physical parts (e.g., CPU, monitor).
- Software: Instructions for hardware (e.g., Operating Systems, applications).
- - System Software: OS like Windows.
- - Application Software: Apps like MS Word.

Evolution of Computers: Early Tools

- - Abacus: One of the first known devices for calculation, using beads on rods.
- - Mechanical Calculators: Invented by Blaise Pascal (Pascaline). Used gears and wheels.
- - Example: Image of abacus and Pascaline.
- Progressed from basic calculations to more complex mechanical devices.

Evolution of Computers

- 1. Abacus to mechanical calculators.
- 2. First Gen: Vacuum tubes (large, slow).
- 3. Second Gen: Transistors (smaller).
- 4. Third Gen: Integrated Circuits (compact).
- 5. Fourth Gen: Microprocessors (PCs).
- 6. Supercomputers (high power).

Generations of Computers (1st and 2nd)

- - First Generation (Vacuum Tubes): Used in the 1940s-1950s. Examples: ENIAC, UNIVAC.
- - Second Generation (Transistors): Replaced vacuum tubes, smaller and faster. Late 1950s to mid-1960s.

First Generation (1940-1956) Vacuum Tube

A UNIVAC computer

Second Generation (1956-1963)
Transistors

IBM 7000

Generations of Computers (3rd and 4th)

- - Third Generation (Integrated Circuits): 1960s-1970s. Smaller and faster due to integrated circuits. Example: IBM 360.
- - Fourth Generation (Microprocessors): 1970s onwards. Introduction of microprocessors. Examples: Personal Computers (PCs).

Third Generation (1964-1971)
Integrated Circuits

IBM 360

Fourth Generation (1971-Present) Microprocessors

IBM 4341

Supercomputers and Modern Evolution

- - Supercomputers: Highly powerful systems for complex tasks. Example: IBM’s Summit.
- - Current Trends: Cloud computing, AI, and quantum computing.

Fifth Generation (Present and Beyond) Artificial Intelligence

Apple Computer Design Evolution

with Base Prices

Apple I – $667

1976

Apple II – $1298

1977

Apple III – $7800

1980

Apple Lisa – $9995

1983

Macintosh – $1995

1984

Apple IIGS – $999

1986

Macintosh II – $5500

1987

PowerMac 5200 – $1900

1995

iMac G3 – $1299

1998

iMac G4 – $1299

2002

iMac G5 – $1299

2004

iMac Unibody – $1199

2009

Technological Advancements: Efficiency

- - Multi-core Processors: Allow simultaneous execution of multiple tasks.
- - Memory Improvements: Faster access using SSDs and modern RAM compared to traditional hard drives.

Technological Advancements: Size Reduction

- - Miniaturization of Components: From large room-sized mainframes to handheld devices.
- - Example: Laptops, smartphones replacing larger devices.

Technological Advancements: Cost Reduction

- - Cheaper Manufacturing and Mass Production reduced costs.
- - Accessibility: Wider adoption of technology due to affordability.

Innovations in Connectivity and AI

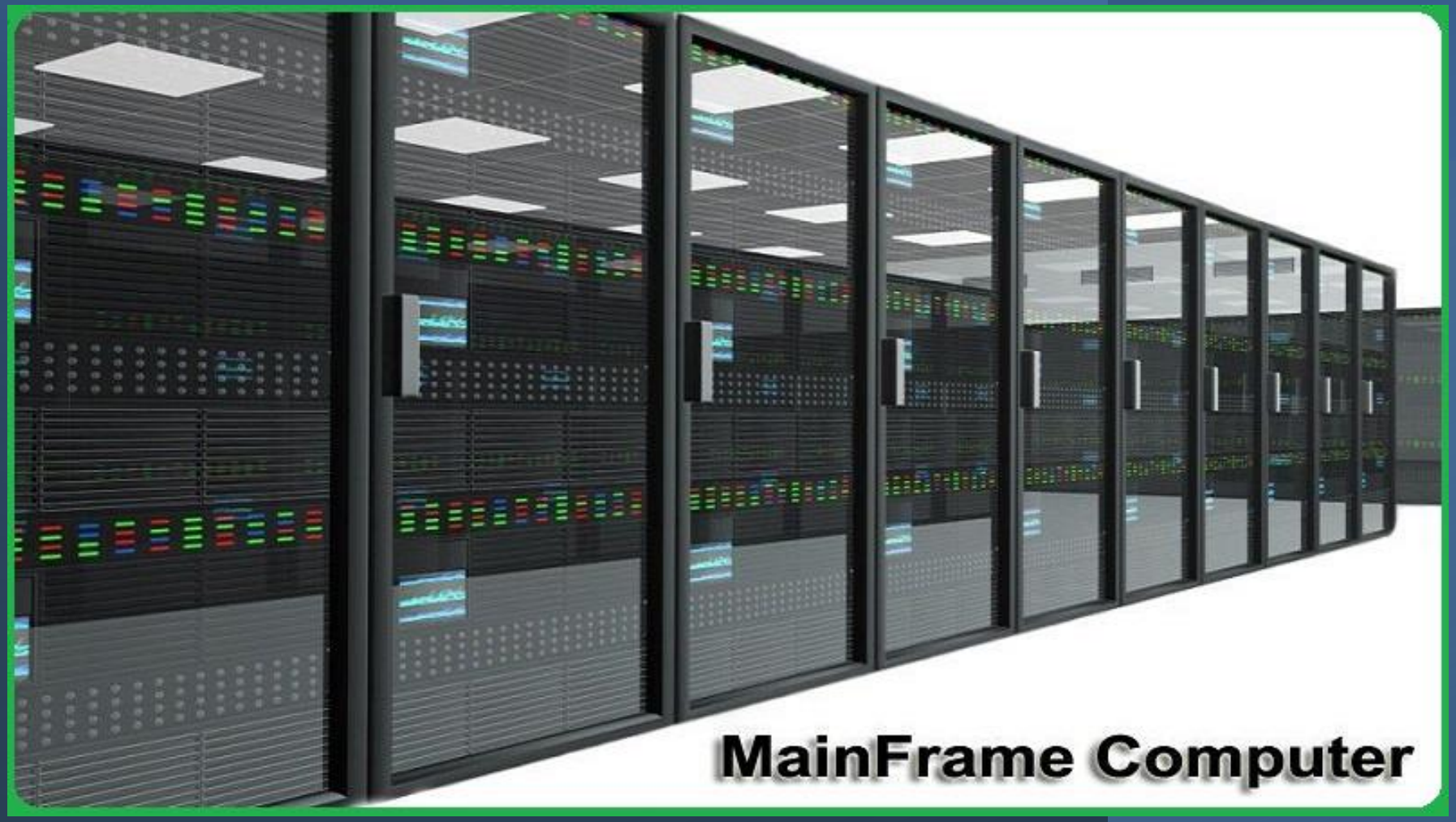
- - Connectivity: Internet, wireless networks transforming communication.
- - AI and Machine Learning: Systems can learn and adapt for various tasks.

Types of Computer

- **By Function**
  - Analog Computer
  - Digital Computer
  - Hybrid Computer
- **By Size and Power**
  - Micro Computer
  - Mini Computer
  - Mainframe Computer
  - Super Computer
- **By Purpose**
  - Special Purpose Computer
  - General Purpose Computer

Mainframe Computers - Introduction

- Mainframe computers are large, powerful systems primarily used by large organizations for bulk data processing tasks such as census, enterprise resource planning, and transaction processing. Example: IBM Z Series mainframes.


MainFrame Computer

Mainframe Computers - Features

- 1. High processing power and large memory capacity.
- 2. Capable of handling thousands of users simultaneously.
- 3. Robust security and high reliability.
- 4. Designed for mission-critical applications.

Mainframe Computers - Importance

- Mainframes are critical for industries that require large-scale transaction processing, data storage, and real-time processing. Examples include banking institutions, healthcare systems, and government agencies handling vast amounts of data.

Minicomputers - Introduction

- Minicomputers, smaller than mainframes but powerful, are used by mid-sized businesses and scientific laboratories. They support multiple users and are often used as servers. Example: DEC PDP-11.

Minicomputers - Features

- 1. Multi-user capabilities and moderate processing power.
- 2. Flexible in handling tasks such as computation, data analysis, and industrial control.
- 3. Cost-effective compared to mainframes.

Minicomputers - Importance

- Minicomputers have been important in industries like manufacturing, research, and business operations, enabling multi-user access and moderate computational needs. They paved the way for modern servers and network-based computing.

Microcomputers (Personal Computers) - Introduction

- Microcomputers include desktops, laptops, tablets, and smartphones designed for individual use. They are versatile and used for everyday tasks like web browsing, creating documents, and gaming.

Microcomputers - Features

- 1. Affordable and compact size.
- 2. Wide range of applications from business to entertainment.
- 3. Easy to use and configure.

Microcomputers - Importance

- Microcomputers have transformed personal and professional lives, providing computing power to individual users. They are widely used in homes, schools, and offices. Examples include Dell PCs, MacBooks, and Android smartphones.

Local Area Networks (LAN) - Introduction

- LANs connect computers and devices within a limited area, such as an office, school, or home. They allow resource sharing, like printers, storage, and data files among connected devices.

Local Area Networks - Features

- 1. High-speed data transfer within a limited geographical area.
- 2. Supports resource sharing (e.g., printers, files).
- 3. Simple to set up and manage.

Classification of Computers

- - Mainframe: Large systems used by organizations for bulk processing. Example: Banking systems.
- - Minicomputers: Medium-sized systems for specific tasks.
- - Microcomputers: Personal devices like PCs, laptops, tablets.

Local Area Networks - Importance

- LANs enable efficient communication and resource sharing within an organization, boosting productivity and collaboration. They are common in homes and workplaces for quick networking. Example: Office LAN connecting multiple devices.

Wide Area Networks (WAN) - Introduction

- WANs extend over a large geographical area, connecting multiple LANs. The internet is the largest example of a WAN, enabling global communication and information sharing.

Wide Area Networks - Features

- 1. Covers large distances, such as cities, countries, or continents.
- 2. Uses different transmission technologies (e.g., satellite, leased lines).
- 3. Secure and scalable connections.

Wide Area Networks - Importance

- WANs connect geographically distant locations, enabling organizations to communicate, collaborate, and access resources. Example: Corporate networks linking branches worldwide. The internet itself is the largest WAN.

Networks: LAN and WAN

- - Local Area Network (LAN): Connects computers in a limited area like an office.
- - Wide Area Network (WAN): Covers broader geographic areas (e.g., the internet).

Network Models: Client-Server and Peer-to-Peer

- - Client-Server Model: Centralized server serving multiple clients.
- - Peer-to-Peer (P2P): All nodes have equal roles. Example: File-sharing systems.

What is a Programming Language?

- - Definition: A set of instructions used to communicate with computers.
- - Purpose: Automate tasks, solve problems, build applications.

Low-Level vs. High-Level Languages

- - Low-Level: Close to hardware, difficult for humans. Example: Assembly Language.
- - High-Level: Easier for humans, abstract. Examples: Python, Java, C++.

Software Classification

- - System Software: Manages hardware (e.g., Operating Systems like Windows, Linux).
- - Application Software: Performs specific tasks (e.g., Word processors, web browsers).

System Software - Introduction

- Manages hardware and system operations.
- Examples include Operating Systems (OS) like Windows, Linux, macOS.
- System utilities like device drivers and security software.

System Software - Features

- 1. Resource Management: Manages CPU, memory, and I/O devices.
- 2. Provides a user interface (e.g., Graphical User Interface in Windows).
- 3. Ensures system security and manages software updates.

System Software - Importance

- Enables the hardware to function effectively.
- Provides the platform for application software to run.
- Facilitates user interaction with the system.

System Software - Advantages & Disadvantages

- Advantages: Streamlines hardware operations, ensures system stability.
- Disadvantages: Complex systems may require more resources and regular updates.
- Potential security vulnerabilities if not properly managed.

Application Software - Introduction

- Performs specific user-oriented tasks.
- Examples include Word Processors (MS Word), Web Browsers (Chrome), and Media Players.
- Typically designed for end-user use.

Application Software - Features

- 1. User-friendly interfaces and customizability.
- 2. Supports a wide range of tasks (e.g., document editing, gaming).
- 3. Can be standalone or bundled (e.g., Microsoft Office Suite).

Application Software - Importance

- Enhances productivity (e.g., spreadsheets for data analysis).
- Provides essential tools for daily use (browsing, communicating).
- Improves business processes and personal tasks.

Application Software - Advantages & Disadvantages

- Advantages: Easy to use, tailored to user needs, wide functionality.
- Disadvantages: May depend on system software, costs associated with updates.
- Potential compatibility issues with different systems.

Programming Languages - Purpose

- A way to communicate instructions to a computer.
- Automates tasks, solves problems, builds applications.
- Common languages include Python, Java, C++.

Programming Languages - Features

- 1. Syntax: Rules governing structure.
- 2. Abstraction levels (e.g., low-level assembly vs. high-level Python).
- 3. Libraries and frameworks support for extended functionality.

Programming Languages - Importance

- Enables software development and automation.
- Used across various fields like web development, AI, system software.
- Essential for creating new technologies and solutions.

Programming Languages - Advantages & Disadvantages

- Advantages: Flexibility, scalability, efficiency in automation.
- Disadvantages: Learning curve, compatibility issues between languages.
- Security concerns if poorly coded.

Use Cases of Programming Languages

- - Web Development: HTML, CSS, JavaScript.
- - Data Science: Python, R.
- - Systems Programming: C, C++.

Programming Language Examples

- - Python: Simple 'Hello World' program.
- print('Hello World')
- - JavaScript: Alert message.
- alert('Welcome!');

Technological Advancements

- Efficiency: Faster processing (multi-core).
- Size Reduction: From large rooms to handheld devices.
- Cost Reduction: Affordable computing.

Computer Programming Languages

- 1. Low-Level: Machine/Assembly.
- 2. High-Level: Easy to use (e.g., Python, Java).
- Examples:
- - C: System programming.
- - Python: Web development, AI.
- - JavaScript: Web interactivity.

Classification of Programming Languages

- 1. Procedural: Step-by-step (e.g., C).
- 2. Object-Oriented: Objects and data (e.g., Java).
- 3. Scripting: Automation (e.g., JavaScript).
- 4. Markup: Content structuring (e.g., HTML).

Purpose of Programming Languages

- Facilitate Communication: Translating code to instructions.
- Variety of Applications:
- - Web Development: HTML, CSS, JavaScript.
- - System Programming: C.
- - Data Science: Python.