

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
Київський електромеханічний фаховий коледж



Іноземна мова (за професійним спрямуванням)

Посібник

для розвитку професійного мовлення

для студентів II курсу спеціальності «Комп'ютерна інженерія»

Схвалено для використання та
ЗАТВЕРДЖЕНО
цикловою комісією
філологічних дисциплін

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Рецензовано цикловою комісією
«Комп'ютерна інженерія»

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**Посібник для розвитку професійного мовлення з навчальної дисципліни
«Іноземна мова (за професійним спрямуванням)
для студентів спеціальності «Комп'ютерна інженерія»**

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1. Вступ

Для студентів спеціальності «Комп'ютерна інженерія» англійська мова є основною для успішного навчання та кар'єри. Вивчення термінології, граматики та особливостей мови, яку використовують фахівці галузі, дозволяє не лише розуміти технічну документацію, а й ефективно спілкуватися в професійному середовищі. Цей посібник є першою частиною трилогії і спрямований на поповнення у здобувачів освіти словникового запасу на тему «Апаратне забезпечення та компоненти комп'ютера» та розвитку вміння оперувати відповідною лексикою під час усного та письмового спілкування. У цьому посібнику ми розглянемо основні аспекти, що допоможуть здобувачам освіти стати компетентними в технічній англійській мові.

1.1. Лексика для комп'ютерних наук

Основні терміни

1. **Hardware (Апаратне забезпечення)**
 - **Processor (CPU)** — процесор
 - **Motherboard** — материнська плата
 - **RAM (Random Access Memory)** — оперативна пам'ять
 - **Hard Drive (HDD)** — жорсткий диск
 - **Power Supply Unit (PSU)** — блок живлення
 - **Graphics Card (GPU)** — графічна карта
2. **Software (Програмне забезпечення)**
 - **Operating System (OS)** — операційна система
 - **Application** — програма
 - **Driver** — драйвер
 - **Database** — база даних
 - **Compiler** — компілятор
 - **IDE (Integrated Development Environment)** — інтегроване середовище розробки
3. **Networking (Мережі)**
 - **IP Address** — IP-адреса
 - **Router** — маршрутизатор
 - **Firewall** — брандмауер
 - **Wi-Fi** — бездротова мережа
 - **Ethernet** — Ethernet (проводова мережа)
4. **Programming (Програмування)**
 - **Algorithm** — алгоритм
 - **Code** — код
 - **Bug** — помилка

- **Function** — функція
- **Loop** — цикл
- **Variable** — змінна
- **Class** — клас

1.2. Технічна англійська мова. Важливі теми:

Програмування

Vocabulary:

- **Syntax** — синтаксис
- **Library** — бібліотека
- **Framework** — фреймворк
- **Object-Oriented Programming (OOP)** — об'єктно-орієнтоване програмування
- **Debugging** — налагодження
- **Exception Handling** — обробка винятків
- **Version Control** — контроль версій

Example sentences:

- "The syntax of Python is easy to learn."
- "I need to debug my code to find the error."
- "Use version control to manage changes in your codebase."

Апаратне забезпечення та компоненти комп'ютера

Vocabulary:

- **Chip** — чіп
- **Peripheral devices** — периферійні пристрої
- **Expansion slot** — розширювальний слот
- **Solid-state drive (SSD)** — твердотільний накопичувач
- **Heat sink** — радіатор
- **Overclocking** — розгін

Example sentences:

- "The CPU is the main chip in the computer."
- "We need to install a new expansion card for the graphics upgrade."
- "Overclocking can improve performance but may cause overheating."

Мережі та Інтернет

Vocabulary:

- **Bandwidth** — пропускна здатність
- **Protocol** — протокол
- **DNS (Domain Name System)** — система доменних імен
- **Cloud computing** — хмарні обчислення
- **VPN (Virtual Private Network)** — віртуальна приватна мережа

Example sentences:

- "The bandwidth of this network connection is quite high."
 - "We need to set up a VPN to secure our internet traffic."
 - "Cloud computing allows us to store and process data remotely."
-

1.3. Практичні вправи до вступу

Завдання 1: Визначення термінів

Визначте правильне значення термінів:

1. **RAM**
 - a) Постійна пам'ять
 - b) Оперативна пам'ять
 - c) Жорсткий диск
2. **Router**
 - a) Пристрій для підключення до Інтернету
 - b) Маршрутизатор
 - c) Периферійний пристрій

Завдання 2: Переклад речень

Перекладіть наступні речення з англійської на українську:

1. "You need to configure the firewall before connecting to the network."
2. "The compiler will generate an error if the syntax is incorrect."
3. "The new software update improves system performance."

Завдання 3: Рольова гра

У групах розіграйте ситуацію, де один студент є розробником програмного забезпечення, а інший — системним адміністратором. Розробник описує

проблему з програмою, а адміністратор дає поради по усуненню помилки, використовуючи англійську мову.

TOPICS

Topic 1. Processor (CPU)

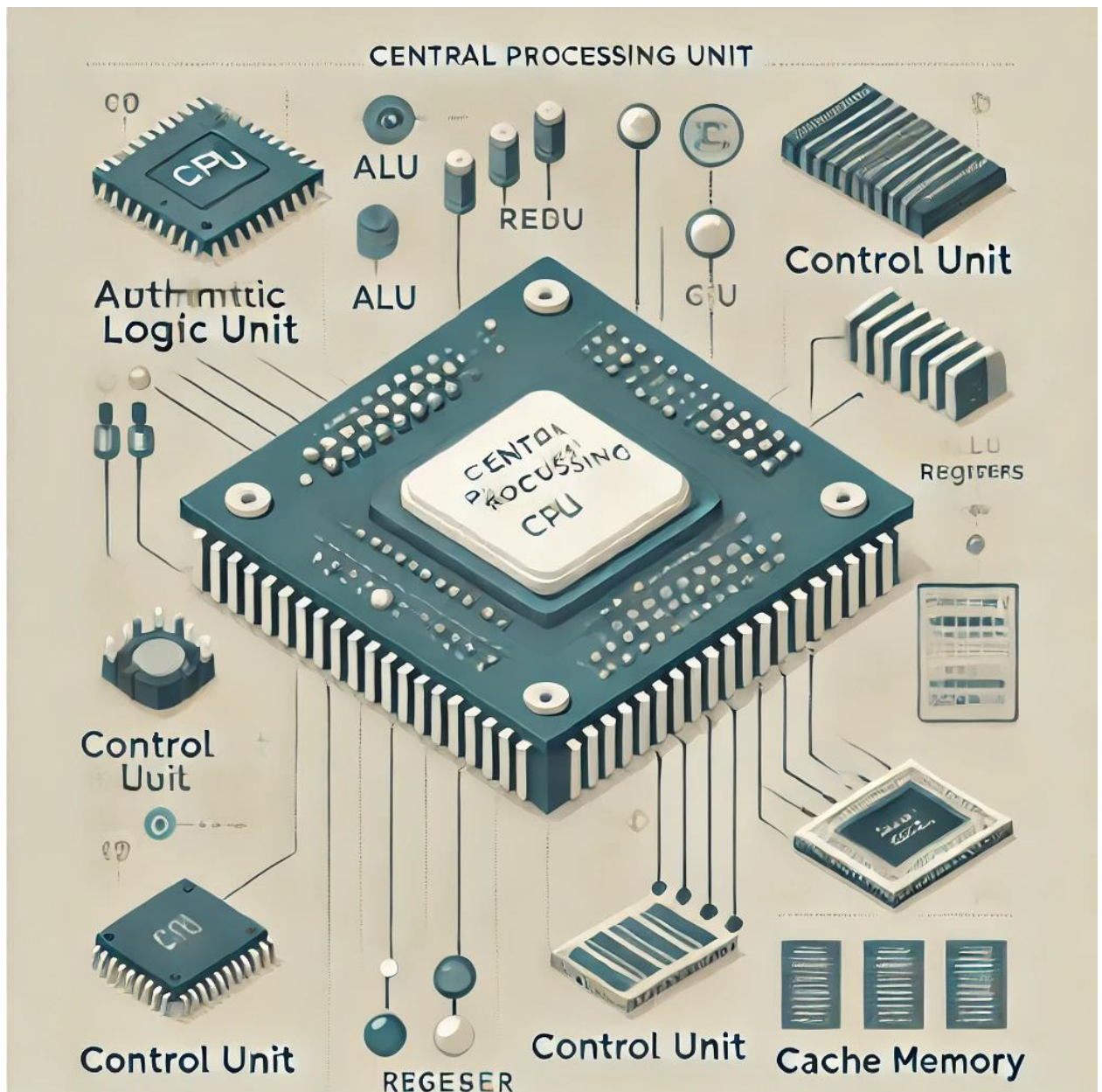
1. Introduction to the CPU (Central Processing Unit)

The **CPU**, also known as the **processor**, is the **brain** of a computer. It is responsible for executing instructions that allow the computer to run programs, perform calculations, and control other components of the system. The CPU processes data and performs calculations required for various tasks in both software and hardware operations.

2. Structure and Components of a CPU

A CPU consists of several key components that work together to perform its tasks:

- **ALU (Arithmetic Logic Unit):**
The ALU is responsible for performing arithmetic and logical operations, such as addition, subtraction, multiplication, division, and comparisons.
- **Control Unit (CU):**
The Control Unit directs the operation of the processor. It decodes the instructions from memory and sends signals to the other parts of the CPU to execute them.
- **Registers:**
Registers are small, fast storage locations within the CPU that hold data and instructions temporarily. Common registers include:
 - **Program Counter (PC):** Holds the address of the next instruction.
 - **Accumulator (ACC):** Stores intermediate results of calculations.
- **Cache Memory:**
Cache is a small, high-speed memory located inside the CPU or very close to it. It stores frequently used data and instructions to speed up access.
- **Buses:**
Buses are communication pathways that transfer data between different components of the CPU and other parts of the computer. There are different types of buses:
 - **Data Bus:** Transfers data.
 - **Address Bus:** Carries memory addresses.
 - **Control Bus:** Carries control signals.



3. Types of CPUs

There are various types of processors based on their architecture and intended use:

- **Single-Core Processors:**
A single-core processor can execute one instruction at a time. This was the standard for many years but is now largely replaced by multi-core processors.
- **Multi-Core Processors:**
These processors have multiple cores (independent processing units) within a single chip. Each core can handle a separate task or thread, which improves performance, especially for multitasking and parallel processing.
- **RISC (Reduced Instruction Set Computing):**
RISC processors use a small, optimized set of instructions, which allows for

faster execution. These CPUs are used in mobile devices, embedded systems, and some high-performance computing tasks.

- **CISC (Complex Instruction Set Computing):**
CISC processors have a larger set of instructions, allowing them to perform more complex tasks per instruction. CISC processors are common in desktop and server environments.

4. How the CPU Works

The CPU operates in a series of steps that are collectively known as the **Fetch-Decode-Execute Cycle**:

- **Fetch:**
The CPU fetches an instruction from memory (RAM) using the Program Counter (PC).
- **Decode:**
The Control Unit decodes the instruction to determine which operation is to be performed.
- **Execute:**
The ALU or other components execute the instruction (perform calculations, move data, etc.).
- **Store:**
The result is stored in a register or sent to memory.

5. Clock Speed and Performance

The performance of a CPU is often measured by its **clock speed**, which is the rate at which the CPU can execute instructions. It is typically measured in **gigahertz (GHz)**, where 1 GHz equals one billion cycles per second. However, **clock speed** alone is not a complete indicator of performance. Other factors, such as the number of cores, the architecture of the CPU, and its cache size, also affect the overall speed and performance.

6. CPU Cooling

Since the CPU performs a large number of calculations and processes data quickly, it generates a significant amount of heat. To keep the CPU operating within safe temperature limits, cooling mechanisms are required, such as:

- **Heat Sinks:**
These are metal components that dissipate heat away from the CPU.
- **Fans:**
Fans are used to blow air across the heat sink and lower the temperature.

- **Liquid Cooling:**
In high-performance systems, liquid cooling systems can be used to remove heat more efficiently.

7. CPU Architecture

CPU architecture refers to the design and structure of a processor. Some of the key architectural features include:

- **Instruction Set Architecture (ISA):**
The ISA defines the set of instructions that the CPU can understand and execute. Examples include **x86** (used in Intel and AMD processors) and **ARM** (used in mobile devices).
- **Pipelining:**
Pipelining is a technique that allows multiple instructions to be processed simultaneously by overlapping stages of execution. This improves performance by utilizing the CPU more efficiently.
- **Hyper-Threading:**
Hyper-Threading is a technology used in some Intel processors where a single physical CPU core can execute two threads simultaneously, effectively improving multitasking performance.

8. CPU Manufacturers

The two major manufacturers of consumer CPUs are **Intel** and **AMD**:

- **Intel:**
Known for its **Core** and **Xeon** processors, Intel has long been a leader in the CPU market, especially for desktops, laptops, and servers.
- **AMD:**
AMD is known for its **Ryzen** and **EPYC** processors, offering strong competition to Intel in both consumer and enterprise markets. AMD CPUs often provide a better performance-to-price ratio.

9. Vocabulary Related to CPU

- **Clock Cycle:** The time taken for the CPU to complete one cycle of fetching, decoding, and executing an instruction.
- **Thread:** A single sequence of instructions in a program that can be executed independently.
- **Parallel Processing:** The simultaneous execution of multiple instructions or tasks across multiple processors or cores.
- **Overclocking:** The process of increasing the clock speed of the CPU to make it run faster than its original design specifications.

10. Example Sentences

- "The **CPU** is often referred to as the **brain** of the computer because it performs most of the data processing."
 - "With a **multi-core processor**, you can run several applications simultaneously without significant performance loss."
 - "A **high clock speed** and a large **cache memory** allow for faster processing and reduced delays."
 - "The **Control Unit** sends instructions to the **ALU** to carry out mathematical operations."
 - "I overclocked my **processor** to improve performance, but now I need a better **cooling system**."
-

11. Exercises

Exercise 1: Fill in the blanks with the correct term:

1. The _____ unit is responsible for executing mathematical and logical operations.
2. A _____ processor has multiple cores that can process instructions simultaneously.
3. A CPU's **clock speed** is measured in _____.
4. The _____ is a small memory inside the CPU that holds frequently accessed data.
5. _____ is the process of running the CPU at a higher clock speed than its default setting.

Exercise 2: True or False

1. The CPU only performs mathematical operations and cannot handle logical operations. (True/False)
2. Multi-core processors are less efficient for multitasking than single-core processors. (True/False)
3. Cache memory is slower than RAM but faster than the CPU. (True/False)
4. Overclocking increases the CPU's power consumption and generates more heat. (True/False)

Exercise 3: Multiple Choice

Choose the correct answer based on the information from the text.

1. **What does the ALU (Arithmetic Logic Unit) do?**

- A) Controls the processor's operations
 - B) Performs arithmetic and logical operations
 - C) Stores instructions and data
 - D) Transfers data between components
2. **Which of the following technologies allows one physical core to run two threads simultaneously?**
- A) Hyper-Threading
 - B) RISC
 - C) Multi-Core
3. **Which part of the CPU stores frequently used data to speed up access?**
- A) Cache Memory
 - B) ALU
 - C) Control Unit
 - D) Registers

Exercise 4: Fill in the blanks

Fill in the blanks in the following sentences using the correct terms from the text.

1. _____ performs arithmetic and logical operations such as addition and comparison.
2. _____ is a technology that allows multiple instructions to be processed simultaneously, improving performance.
3. A multi-core processor is able to handle multiple tasks at once, which improves _____ during multitasking.

Exercise 5: Comprehension Questions

Provide brief answers to the following questions.

1. What is the main function of the CPU?
2. How do RISC and CISC processors differ from each other?
3. How is CPU performance determined?
4. Why is it important to cool the CPU?

Exercise 6: Explain the Terms

Using the text, explain the meanings of the following terms:

1. **Clock Speed**
2. **Cache Memory**
3. **Overclocking**

Exercise 7: Matching Test

Match the terms with their correct descriptions.

Terms	Description
1. RISC	A) A processor with a large set of instructions that performs complex operations per instruction
2. Multi-Core	B) A technology that allows multiple instructions to be processed simultaneously to improve speed
3. CISC	C) A processor with multiple cores capable of handling several tasks at once
4. Hyper-Threading	D) A processor that uses a smaller set of instructions for faster execution

12. Conclusion

The **CPU** is an essential component of any computer system, responsible for executing instructions and performing calculations. Understanding how it works, its components, and its different types will help students in computer engineering build a deeper knowledge of how computers process data. This knowledge is fundamental for anyone pursuing a career in **computer hardware design, software development, or systems engineering**.

Topic 2: Motherboard

1. Introduction to the Motherboard

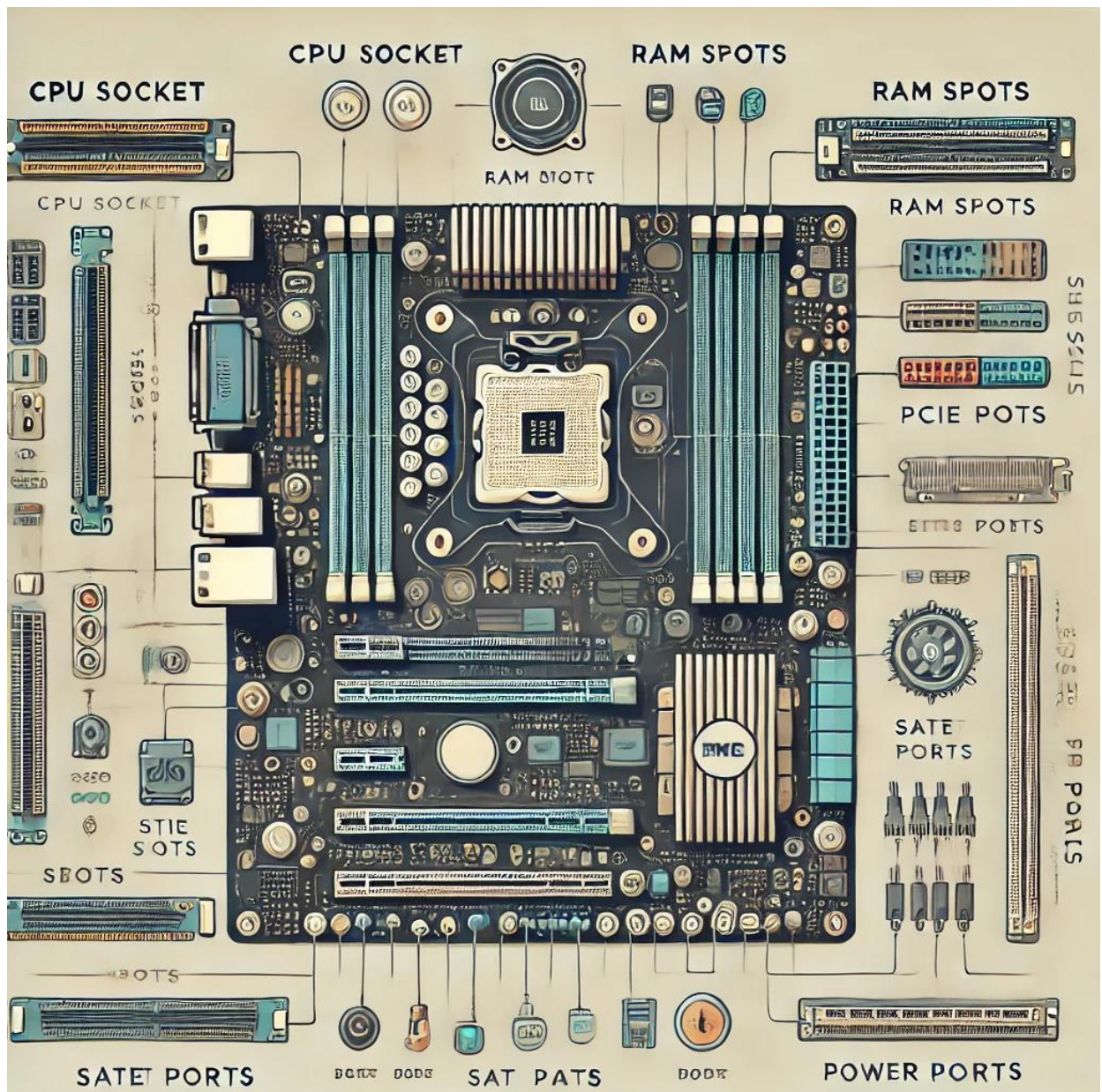
The **motherboard** is the central printed circuit board (PCB) in a computer that connects and allows communication between all the essential components of the system. It provides the necessary infrastructure for the CPU, memory, storage devices, power supply, and peripheral components to work together. Essentially, the motherboard acts as the "backbone" of the computer, linking all of its parts.

2. Key Components of a Motherboard

A typical motherboard has several important components and connectors that allow for various interactions between hardware components:

- **CPU Socket:**
This is the slot on the motherboard where the **Central Processing Unit (CPU)** is installed. It is designed to fit specific types of processors, such as **Intel** or **AMD** CPUs.
- **RAM Slots (DIMM Slots):**
The motherboard has several slots for **RAM (Random Access Memory)**. These slots are used to install memory modules (e.g., DDR4, DDR5), which temporarily store data for quick access by the CPU.

- **Power Connectors:**
The motherboard has power connectors (such as the **24-pin ATX** connector) that supply power from the **power supply unit (PSU)** to the system.
- **PCIe Slots (Peripheral Component Interconnect Express):**
These slots are used for installing expansion cards, such as **graphics cards (GPU)**, **network interface cards (NIC)**, sound cards, and **SSD (Solid-State Drive)** cards. **PCIe x16** slots are primarily used for high-performance devices like GPUs, while **PCIe x1** slots are used for less demanding peripherals.
- **Chipset:**
The chipset is a collection of integrated circuits that manage the communication between the CPU, memory, and other peripherals. It helps control data flow between the processor and other components.
- **Storage Connectors:**
The motherboard has connectors for storage devices such as **SATA** connectors (for traditional hard drives or SSDs) and **M.2** slots (for high-speed NVMe SSDs). M.2 slots provide faster data transfer rates compared to SATA.
- **I/O Ports:**
The **input/output (I/O)** ports are found on the back of the motherboard and provide connections for external devices such as USB ports, **HDMI**, **Ethernet**, audio jacks, and sometimes legacy ports like **VGA** or **PS/2**.
- **BIOS/UEFI Chip:**
The **Basic Input/Output System (BIOS)** or **Unified Extensible Firmware Interface (UEFI)** is embedded on a chip on the motherboard and is responsible for initializing and testing hardware components during boot-up. UEFI has become the modern replacement for the older BIOS and offers additional features such as graphical interfaces and faster boot times.
- **CMOS Battery:**
The CMOS battery powers the **CMOS** (Complementary Metal-Oxide-Semiconductor) chip, which stores system settings such as the time and date when the computer is powered off. It allows the motherboard to retain critical settings even when the system is unplugged.
- **Heatsinks and VRMs:**
Heatsinks are metal components attached to heat-generating parts of the motherboard, like voltage regulators, to dissipate heat. **Voltage Regulator Modules (VRMs)** supply stable voltage to the CPU and other parts of the motherboard, and they are often equipped with heatsinks to prevent overheating.



3. Types of Motherboards

Motherboards vary in size and features depending on the form factor, which determines their compatibility with different PC cases and hardware components. The most common motherboard form factors are:

- **ATX (Advanced Technology eXtended):**
The **ATX** form factor is the standard for most desktop motherboards. It is large and offers multiple expansion slots, RAM slots, and storage connectors. ATX boards usually come with a variety of ports and slots, providing flexibility for various configurations.
- **Micro-ATX:**
Micro-ATX boards are smaller than ATX boards but still offer a good

balance of features. They typically have fewer expansion slots and a reduced number of RAM slots compared to ATX boards but are still compatible with most components.

- **Mini-ITX:**

Mini-ITX boards are even smaller than micro-ATX and are often used in compact or custom-built PCs, home theater PCs (HTPCs), and servers. They generally offer fewer expansion slots and ports but are ideal for systems where space is limited.

- **E-ATX (Extended ATX):**

E-ATX motherboards are larger than standard ATX boards and are typically used in workstations or high-performance systems. They provide more room for additional RAM slots, storage connectors, and PCIe slots.

4. Motherboard Features and Specifications

When choosing a motherboard, it's important to consider its features and specifications to ensure compatibility with other system components and meet the needs of your build.

- **Socket Type:**

The socket type must match the CPU you plan to install. Common socket types include **LGA1151** (Intel) and **AM4** (AMD). The socket must support the specific generation of CPU you intend to use.

- **Chipset:**

The chipset controls the features and capabilities of the motherboard, such as overclocking support, the number of PCIe lanes, and the types of storage supported (e.g., SATA, NVMe). For example, Intel's **Z-series** chipsets support overclocking, while the **H-series** chipsets typically do not.

- **RAM Support:**

Motherboards support different types and speeds of RAM (e.g., DDR4, DDR5). Check the maximum supported capacity and speed for the best performance.

- **Expansion Slots:**

PCIe slots provide room for adding components such as **GPUs**, **sound cards**, **Wi-Fi cards**, and **network interface cards**. Motherboards often have a mix of **x16**, **x8**, **x4**, and **x1** PCIe slots, with **x16 slots** being the most common for GPUs.

- **Storage and Connectivity:**

Ensure that the motherboard supports the type of storage devices you want to use, such as **SATA** and **M.2 NVMe** SSDs. Look for multiple storage ports if you plan to install several drives.

- **I/O Ports and USB Support:**

A motherboard with a wide range of **USB** ports, including **USB 3.0**, **USB**

3.1, and **USB-C**, ensures greater flexibility for connecting peripherals. You should also check for other important I/O ports such as **HDMI**, **Ethernet**, and audio jacks.

- **Integrated Graphics:**

Some motherboards include integrated graphics (known as **IGP**), which can be useful for systems that don't require a dedicated graphics card. However, if you plan to run graphics-intensive applications, a dedicated **GPU** is recommended.

5. Motherboard and Overclocking

Motherboards designed for **overclocking** allow users to push the CPU and RAM beyond their default speeds for improved performance. **Z-series** Intel chipsets and some high-end AMD boards offer enhanced overclocking features, such as:

- **Unlocked CPU Multipliers:** Allow you to increase the CPU's clock speed.
- **VRM Cooling:** To handle the increased power demands during overclocking.
- **Better Power Delivery:** Ensures stable and efficient power supply to components under load.

However, overclocking can generate more heat and stress the system, so proper cooling and power supply are essential when attempting to overclock.

6. Common Motherboard Problems and Troubleshooting

- **No Power:**

If the motherboard doesn't turn on, it could be due to faulty connections, a dead CMOS battery, or a damaged power supply. Make sure all cables are securely connected, and try resetting the CMOS.

- **System Boot Issues:**

If the computer doesn't boot or displays error messages, check the motherboard's **BIOS/UEFI settings** for incorrect configurations, disconnected hardware, or faulty RAM.

- **Overheating:**

Overheating can be caused by poor airflow, a malfunctioning fan, or an insufficient heatsink. Ensure that the CPU cooler is installed correctly and that the case has proper ventilation.

7. Vocabulary Related to Motherboards

- **Form Factor:** The size and shape of the motherboard, such as ATX, Micro-ATX, or Mini-ITX.
 - **Bus:** The pathway that transmits data between the motherboard's components.
 - **PCIe:** A high-speed interface used for expansion cards.
 - **Chipset:** A set of components on the motherboard that manage communication between the CPU, memory, and peripherals.
 - **VRM:** Voltage Regulator Module, which ensures stable voltage supply to the CPU and other components.
-

8. Example Sentences

- "The **motherboard** connects all the components, including the CPU, memory, and storage devices."
 - "Before buying a motherboard, check its **compatibility** with the CPU and the type of RAM you intend to use."
 - "The **power connector** on the motherboard must be properly connected to the **power supply** for the system to turn on."
 - "My motherboard has **four RAM slots**, which will allow me to upgrade to 32GB of memory."
-

9. Exercises

Exercise 1: Match the motherboard component with its description:

1. **PCIe Slot**
2. **CPU Socket**
3. **RAM Slot**
4. **Chipset**
5. **I/O Ports**

- a) Where the CPU is installed.
- b) Allows you to add expansion cards like GPUs and sound cards.
- c) Provides input/output connectivity (USB, Ethernet, Audio).
- d) Controls communication between components.
- e) Used to install RAM modules.

Exercise 2: True or False

1. The **motherboard** is responsible for managing power distribution in the system. (True/False)
2. **M.2** slots are used for installing hard drives and SSDs. (True/False)
3. **RAM slots** can accommodate only one type of memory, such as DDR3 or DDR4. (True/False)
4. The **BIOS** is responsible for booting the system and setting hardware configurations. (True/False)

Exercise 3: Multiple Choice

Choose the correct answer based on the information from the text.

1. **What is the primary function of the motherboard?**
 - A) To store data and instructions
 - B) To connect and allow communication between all essential components
 - C) To power the system
 - D) To process data and run programs
2. **Which of the following connectors is used to install expansion cards like graphics cards or network cards?**
 - A) RAM Slots
 - B) PCIe Slots
 - C) Power Connectors
 - D) Storage Connectors
3. **What is the function of the CMOS battery on the motherboard?**
 - A) To power the CPU
 - B) To store system settings like time and date when the computer is off
 - C) To provide cooling to the motherboard
 - D) To store the operating system

Exercise 4: Fill in the Blanks

Fill in the blanks using the correct terms from the text.

1. The _____ is the slot on the motherboard where the CPU is installed.
2. The _____ connects external devices like USB drives, HDMI, and Ethernet cables to the motherboard.
3. The motherboard's _____ is responsible for controlling data flow between the CPU, memory, and other peripherals.

Exercise 5: True or False

Read the following statements and decide whether they are true or false.

1. **The ATX form factor is the smallest type of motherboard.**
 - True / False
2. **PCIe slots are primarily used for connecting storage devices such as SSDs.**
 - True / False
3. **Overclocking is a process that can increase the performance of the CPU and RAM beyond their default speeds.**
 - True / False

Exercise 6: Short Answer

Answer the following questions based on the text.

1. What are the differences between ATX, Micro-ATX, and Mini-ITX motherboards?
2. Why is it important to check the motherboard's compatibility with the CPU and RAM before purchasing it?
3. What are the key components of a motherboard that help manage power and prevent overheating?

Exercise 7: Vocabulary Matching

Match the term to its correct definition.

Terms	Definitions
1. Form Factor	A) A set of components on the motherboard that manages communication between the CPU, memory, and peripherals.
2. PCIe	B) The size and shape of the motherboard, such as ATX, Micro-ATX, or Mini-ITX.
3. Chipset	C) A high-speed interface used for expansion cards like graphics cards and network cards.
4. VRM	D) A module that ensures stable voltage supply to the CPU and other components.

10. Conclusion

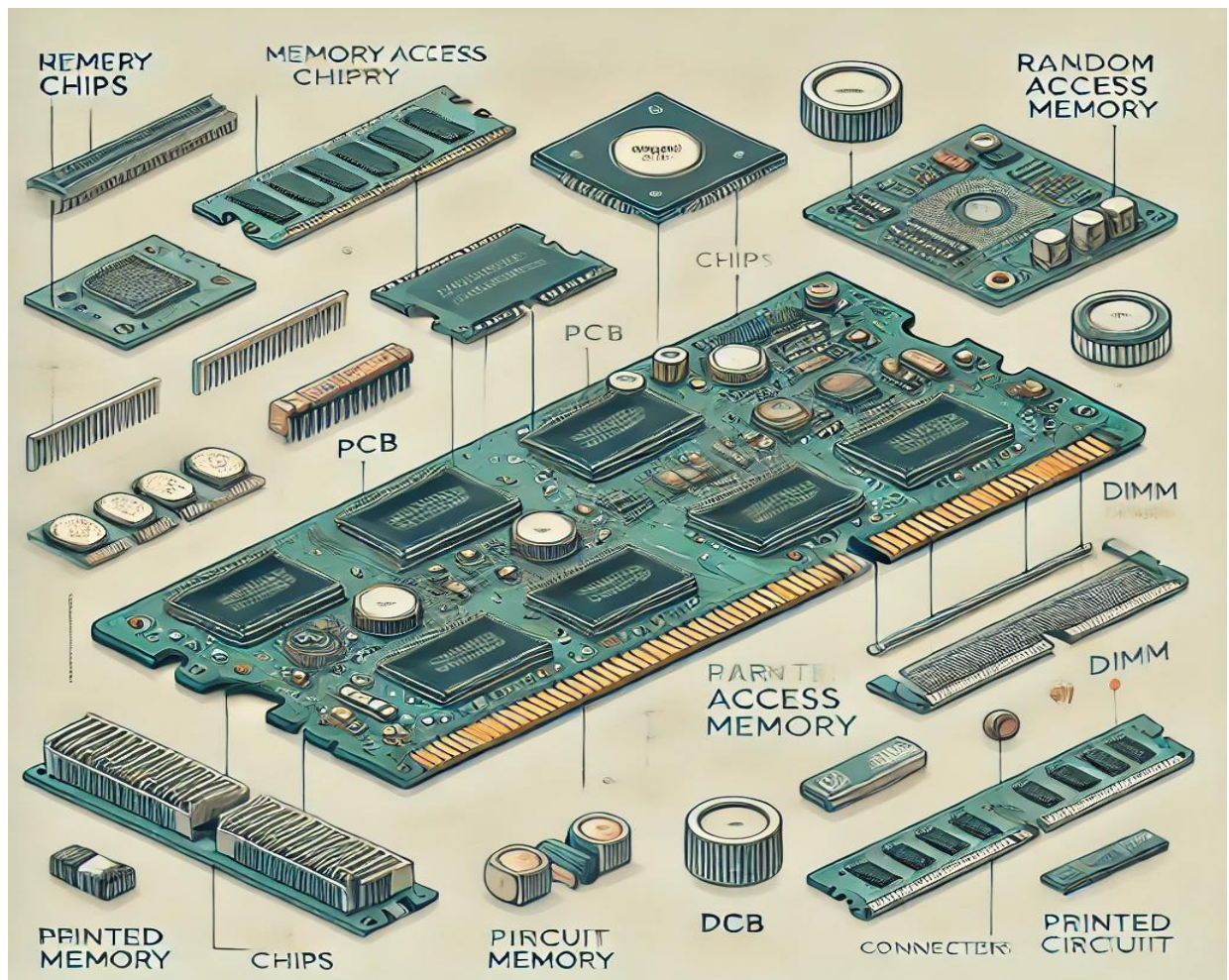
The **motherboard** is a critical component in any computer system, providing the foundation for all other parts to function together. Understanding its features, components, and how it connects various hardware elements will help students in **computer engineering** design and troubleshoot computers effectively.

Topic 3: RAM (Random Access Memory)

1. Introduction to RAM (Random Access Memory)

RAM (Random Access Memory) is a type of **volatile** memory used in computers and other devices to store data that is actively being used or processed. Unlike **storage devices** like hard drives or SSDs, which are used for long-term data storage, RAM is used for short-term tasks and is much faster. When a computer is powered off, the data in RAM is lost, which is why it's called volatile memory.

In simpler terms, RAM serves as a temporary workspace for the processor (CPU) to quickly access and manipulate data. It stores the operating system, programs, and data currently in use, allowing the CPU to access this information at high speed.



2. How RAM Works

When you open an application or file on your computer, the operating system loads part of that data into RAM from the **hard drive** or **SSD**. The CPU can then quickly

retrieve and process that data. The more RAM a computer has, the more data it can store and process at once, which can lead to better performance, especially when running multiple applications simultaneously.

RAM operates in the following steps:

1. **Fetching:** Data is transferred from the storage device (HDD/SSD) into RAM.
 2. **Processing:** The CPU processes the data stored in RAM for tasks such as calculations, running applications, or handling multiple tasks at once.
 3. **Storing:** Temporary data results are kept in RAM until they're no longer needed or the computer is powered down.
-

3. Types of RAM

There are several different types of RAM, each designed for different uses. The most common types of RAM found in modern computers are:

- **DRAM (Dynamic RAM):**
This is the most common type of RAM. It stores data in cells consisting of a capacitor and transistor. DRAM needs to be constantly refreshed to retain data, making it slower compared to other types of RAM. It is used in most personal computers and laptops.
 - **Example: DDR4 and DDR5** are modern types of DRAM commonly used in desktop and laptop systems.
- **SRAM (Static RAM):**
Unlike DRAM, SRAM does not need to be refreshed and retains data as long as the power is on. It is faster but more expensive and uses more physical space, so it is typically used in smaller quantities, like the **cache memory** inside the CPU or in **embedded systems**.
 - **Example: L1, L2, and L3 Cache** memory in processors is made using SRAM.
- **SDRAM (Synchronous DRAM):**
SDRAM is synchronized with the system bus, meaning it works in tandem with the processor's clock speed to increase performance. It is faster than regular DRAM and is used in modern systems.
 - **Example: DDR3, DDR4, DDR5** are types of SDRAM.
- **DDR (Double Data Rate):**
DDR RAM is an advanced version of SDRAM. It allows for the transfer of data on both the rising and falling edges of the clock signal, effectively doubling the speed of the data transfer compared to traditional SDRAM.

DDR technology has evolved through several generations, with DDR4 and DDR5 being the most widely used in modern systems.

- **Example:** DDR4 (used in most desktops and laptops today), DDR5 (newer, faster version).
 - **LPDDR (Low Power DDR):**
This type of RAM is designed to consume less power, making it ideal for mobile devices such as smartphones, tablets, and laptops.
 - **Example:** LPDDR4, LPDDR5.
-

4. Key Features of RAM

- **Capacity:**
RAM capacity is typically measured in **gigabytes (GB)** or **terabytes (TB)**, with the most common consumer computers having between 8GB to 64GB of RAM. High-performance workstations or gaming PCs may have more. The more RAM your system has, the more programs and processes it can handle simultaneously without slowing down.
 - **Speed:**
RAM speed is typically measured in **megahertz (MHz)** or **gigahertz (GHz)**, indicating the rate at which the memory can read and write data. Faster RAM can improve performance, particularly in tasks that involve large amounts of data transfer, like gaming, video editing, or data analysis.
 - **Latency:**
RAM latency refers to the delay between requesting data from the memory and the time it takes for the data to be delivered. Lower latency is better for performance, especially in gaming and real-time applications.
 - **Channels:**
Modern RAM is often configured in **dual-channel** or **quad-channel** configurations, which allows for more data to be transferred simultaneously, improving overall memory bandwidth and performance.
-

5. RAM and Performance

The amount and speed of RAM in a system have a direct impact on overall system performance. Here's how RAM affects different aspects of computer usage:

- **Multitasking:**
If a computer has more RAM, it can run more applications simultaneously without slowing down. For instance, opening multiple browser tabs, running a video editing program, or playing a video game requires a significant amount of RAM. Insufficient RAM can cause the system to use slower

storage devices (like an SSD or HDD) for temporary data, which significantly reduces performance.

- **Gaming:**
Games often require large amounts of RAM to load textures, game worlds, and AI data. Insufficient RAM can cause games to stutter or load slowly. Most modern games recommend at least 8GB to 16GB of RAM.
 - **Video Editing & 3D Rendering:**
Video editors and 3D rendering software (e.g., **Adobe Premiere Pro**, **Blender**) can be memory-intensive, requiring large amounts of RAM to process high-resolution media. Having more RAM allows these applications to run faster and more smoothly.
 - **Virtualization:**
Running virtual machines (VMs) or emulators requires a significant amount of RAM. Each VM or instance needs its own portion of memory to operate independently, and insufficient RAM can slow down or even crash virtualized environments.
-

6. How to Upgrade RAM

Upgrading RAM in a computer is a relatively simple task, but it's important to ensure compatibility with your motherboard and processor. Here are the general steps:

1. **Check Compatibility:**
Ensure the RAM type (e.g., DDR4, DDR5) and speed are supported by your motherboard. Motherboards have a maximum supported RAM size, speed, and configuration (single, dual, or quad-channel).
 2. **Install RAM Modules:**
Power down the system and open the case. Insert the new RAM into the available slots on the motherboard, pressing firmly until it clicks into place. It's typically best to install RAM in pairs or kits (e.g., two 8GB modules for 16GB total) for optimal performance.
 3. **Check RAM Speed and Configuration:**
After installing the RAM, ensure that the system is running it at the correct speed and configuration through the BIOS or operating system. Some motherboards automatically adjust settings, while others may require manual configuration.
-

7. Common RAM Issues

- **System Crashes or Freezes:**
Insufficient or faulty RAM can cause the system to crash or freeze, especially when running memory-intensive applications. Running a **RAM test** using built-in tools like **Windows Memory Diagnostic** or third-party software like **MemTest86** can help identify faulty RAM.
 - **Blue Screen of Death (BSOD):**
A BSOD on Windows systems can sometimes be triggered by defective RAM. Testing the RAM or reinstalling it may help resolve this issue.
 - **Slow Performance:**
If the computer does not have enough RAM, it may use the hard drive or SSD as virtual memory, leading to significantly slower performance. Upgrading the RAM can resolve these slowdowns.
-

8. Vocabulary Related to RAM

- **Volatile Memory:** Memory that loses its data when the system is powered off (e.g., RAM).
 - **Memory Bandwidth:** The rate at which data can be read from or written to the memory by the CPU.
 - **DIMM (Dual Inline Memory Module):** A type of memory module used in desktops, laptops, and servers.
 - **ECC RAM (Error-Correcting Code RAM):** RAM that automatically detects and corrects internal memory errors. It is typically used in servers and workstations.
 - **Latency:** The delay before a transfer of data begins following an instruction for its transfer.
-

9. Example Sentences

- "The computer became significantly slower when the amount of **RAM** was insufficient for running multiple applications."
 - "Upgrading to **16GB DDR4 RAM** allowed my system to run **3D rendering software** much faster."
 - "My laptop has **8GB of LPDDR4 RAM**, which is enough for everyday tasks, but I might upgrade it for gaming."
 - "I encountered a **Blue Screen of Death (BSOD)** after installing faulty RAM, which was causing memory errors."
-

10. Exercises

Exercise 1: Match the RAM Type with its Description

1. **DDR4**
2. **SRAM**
3. **LPDDR4**
4. **ECC RAM**

- a) Used in mobile devices for low power consumption.
- b) Common in desktop computers and laptops, offers high speed.
- c) Does not need refreshing and is used for cache memory in CPUs.
- d) Used in servers and workstations for error detection and correction.

Exercise 2: True or False

1. **RAM** is a non-volatile memory, meaning it retains data when the system is powered off. (True/False)
2. **DRAM** needs to be refreshed constantly, which makes it slower than SRAM. (True/False)
3. Increasing the **RAM capacity** improves multitasking and overall system performance. (True/False)
4. **LPDDR4** RAM is typically used in desktops and servers. (True/False)

Exercise 3: Matching Definitions

Match the terms with their definitions:

Terms:

1. Volatile Memory
 2. DIMM
 3. Memory Bandwidth
 4. Latency
 5. ECC RAM
- Definitions:
- a. The delay before a transfer of data begins following an instruction for its transfer.
 - b. Memory that loses its data when the system is powered off.
 - c. The rate at which data can be read from or written to the memory by the CPU.
 - d. A type of memory module used in desktops, laptops, and servers.
 - e. RAM that automatically detects and corrects internal memory errors.

Exercise 4: True or False

Decide if the following statements are true or false:

1. RAM is a non-volatile type of memory.
2. DRAM requires constant refreshing to retain data.
3. SRAM is slower than DRAM but cheaper to produce.
4. Upgrading RAM often requires checking compatibility with the motherboard.
5. Low RAM capacity can lead to a system using slower storage devices as virtual memory.

Exercise 5: Fill in the Blanks

Complete the sentences using the words from the box:

processor, gigabytes, multitasking, latency, gaming

1. Modern computers typically have between 8 and 64 _____ of RAM.
2. Faster RAM with low _____ improves performance in real-time applications.
3. Insufficient RAM can cause issues during _____ when running multiple applications.
4. RAM serves as a temporary workspace for the _____ to quickly access data.
5. Many _____ applications recommend at least 16GB of RAM for smooth performance.

Exercise 6: Short Answer Questions

Answer the following questions:

1. What happens to the data in RAM when the computer is powered off?
2. Name two examples of DRAM used in modern systems.
3. Why is LPDDR RAM commonly used in mobile devices?
4. What are the benefits of using dual-channel or quad-channel RAM configurations?
5. What tool can be used to diagnose faulty RAM?

Exercise 7: Discussion Prompt

Write a short paragraph (3-5 sentences) answering the following question:
Why is it important to consider both the capacity and speed of RAM when building or upgrading a computer?

11. Conclusion

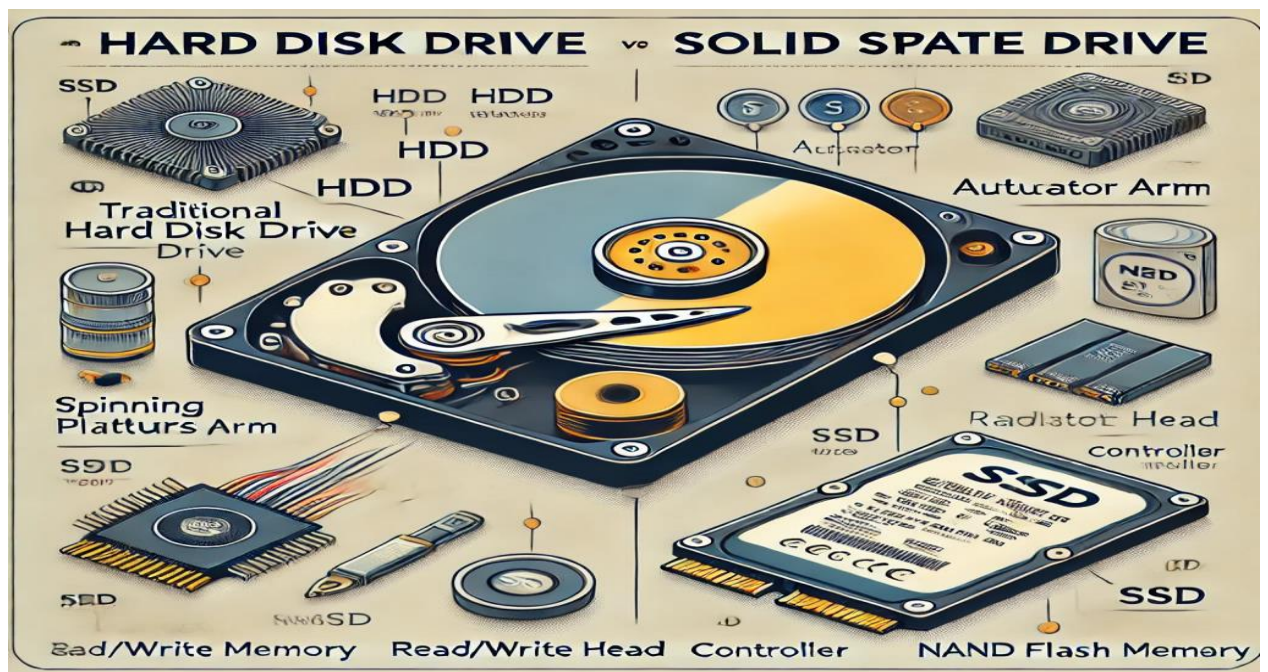
RAM plays a crucial role in determining the performance of a computer or mobile device. By providing fast, temporary storage for active processes, it allows the CPU to perform tasks efficiently. Understanding the different types, capacities, and configurations of RAM can help you build a better-performing system, whether for gaming, multitasking, or resource-intensive applications.

Topic 4: Hard Drive (HDD) and Solid State Drive (SSD)

1. Introduction to Storage Devices

Storage devices are critical components in a computer system that store data for long-term access. Two of the most common types of storage devices are **Hard Disk Drives (HDD)** and **Solid State Drives (SSD)**. Both serve the same primary function—storing data like the operating system, applications, and user files—but they do so in very different ways.

- **HDD (Hard Disk Drive):** A traditional mechanical storage device that uses spinning disks (platters) and a moving read/write head to store and retrieve data.
- **SSD (Solid State Drive):** A newer, faster storage device that uses flash memory (similar to RAM) to store data, with no moving parts.



2. How HDD and SSD Work

- **Hard Disk Drive (HDD):**

An HDD consists of several rotating platters coated with a magnetic material. A **read/write head** moves across the platters to read or write data. The platters spin at high speeds (usually 5400 or 7200 revolutions per minute, or RPM), and data is written or retrieved from the magnetic surface.

Key components of an HDD:

- **Platters:** Circular disks coated with magnetic material.
- **Spindle:** The motor that spins the platters.
- **Actuator Arm:** Moves the read/write head across the platters.
- **Read/Write Head:** A small electromagnetic head that reads and writes data to the platters.
- **Drive Motor:** Powers the spinning of the platters.

How it works: When data is written to an HDD, the write head magnetizes specific areas on the spinning platters to represent binary data (0s and 1s). To read data, the read head detects the magnetization pattern.

- **Solid State Drive (SSD):**

An SSD uses **flash memory** chips (typically NAND flash) to store data. Unlike an HDD, an SSD has no moving parts, which results in faster data access times and greater durability. Data is stored in memory cells, which are organized into blocks. Each block can hold several pages, and each page can store data.

Key components of an SSD:

- **NAND Flash Memory:** The primary storage medium, organized in a grid of memory cells.
- **Controller:** The processor that manages data storage, retrieval, and wear leveling.
- **DRAM Cache:** Some SSDs include a small amount of DRAM to cache data for faster access.
- **Power Loss Protection:** Some SSDs include capacitors to protect data in case of power loss.

How it works: When data is written to an SSD, it is stored in memory cells. The SSD controller handles where and how the data is stored and retrieves it when needed. Since there are no moving parts, the SSD can access data much more quickly than an HDD.

3. Comparison: HDD vs SSD

Feature	Hard Disk Drive (HDD)	Solid State Drive (SSD)
Speed	Slower (data transfer rates around 100-160 MB/s)	Faster (data transfer rates from 200-5500 MB/s)
Storage Capacity	Typically 500GB to 10TB or more	Typically 120GB to 4TB
Durability	Less durable (susceptible to physical damage due to moving parts)	More durable (no moving parts, more resistant to drops)
Power Consumption	Higher (due to spinning platters and moving parts)	Lower (no moving parts, more energy-efficient)
Noise	Noisy (due to spinning platters and moving heads)	Silent (no moving parts)
Heat Generation	Higher (due to mechanical parts)	Lower (more efficient, no moving parts)
Cost	Generally cheaper per GB	More expensive per GB
Lifespan	Longer lifespan in terms of total writes (but more prone to mechanical failure)	Shorter lifespan in terms of total writes, but more reliable (especially with wear leveling and power loss protection)
Form Factor	Typically larger (3.5-inch or 2.5-inch)	Smaller (2.5-inch, M.2, PCIe, U.2)
Application	Suitable for large storage needs (e.g., backup drives, media storage)	Ideal for fast boot times, applications, and high-performance systems

4. Advantages and Disadvantages

- **Advantages of HDD:**
 - **Cost-effective:** HDDs are less expensive per GB compared to SSDs.
 - **Large capacity:** They offer larger storage capacities, making them ideal for users who need to store large amounts of data (e.g., media libraries, backups).
 - **Mature technology:** HDDs have been around for decades and are widely available.
- **Disadvantages of HDD:**
 - **Slower speed:** The mechanical nature of HDDs means that read/write speeds are slower compared to SSDs.

- **Mechanical failure:** Since HDDs have moving parts, they are more prone to mechanical failure, especially if dropped or exposed to physical shock.
 - **Noise and heat:** HDDs generate more noise and heat due to the spinning platters and moving heads.
 - **Advantages of SSD:**
 - **Speed:** SSDs offer significantly faster data access speeds, leading to quicker boot times, application loading, and file transfer speeds.
 - **Durability:** SSDs are more robust since they have no moving parts, making them more resistant to drops or physical impact.
 - **Lower power consumption:** SSDs consume less power, making them more efficient for laptops and portable devices.
 - **Silent operation:** No moving parts means SSDs operate silently.
 - **Disadvantages of SSD:**
 - **Cost:** SSDs are more expensive per GB than HDDs, which makes them less economical for users needing large amounts of storage.
 - **Capacity:** Although SSD capacities are growing, they are still generally smaller than HDDs at the same price point.
 - **Lifespan:** SSDs wear out over time because flash memory cells can only be written to a limited number of times. However, modern SSDs have features like wear leveling and over-provisioning that greatly extend their lifespan.
-

5. Choosing Between HDD and SSD

- **For Performance (Speed):**

If you need faster boot times, quicker file transfers, and overall snappy system performance, an **SSD** is the best option. SSDs are ideal for high-performance tasks like gaming, video editing, and running demanding applications.
 - **For Storage Capacity at Lower Cost:**

If you need large storage at a lower price, such as for data backup, media storage, or archiving, an **HDD** may be the more economical choice.
 - **For Portability and Durability:**

If you're building or upgrading a laptop, or if you need a drive that can withstand drops and physical damage, an **SSD** will offer better reliability and durability.
-

6. Form Factors of HDD and SSD

- **HDD:**
 - **3.5-inch HDD:** Common in desktop computers and servers, providing high storage capacities.
 - **2.5-inch HDD:** More common in laptops, though SSDs are increasingly replacing these in newer laptops.
 - **SSD:**
 - **2.5-inch SSD:** Similar to 2.5-inch HDDs, these are common in laptops and desktops.
 - **M.2 SSD:** A newer, more compact form factor that connects directly to the motherboard. These are often used in ultrabooks and modern desktops for faster speeds.
 - **PCIe (PCI Express) SSD:** High-performance SSDs that use the PCIe interface to provide very high read/write speeds, ideal for gaming PCs or high-end workstations.
 - **U.2 SSD:** A connector type for enterprise storage solutions, often used in servers.
-

7. Common Applications of HDD and SSD

- **HDD:**
 - **Data backups:** Large volumes of data can be stored on HDDs for backup purposes.
 - **File storage:** For general file storage in desktop computers or servers.
 - **Media libraries:** Storing large files like movies, music, and photos.
 - **SSD:**
 - **Operating system:** SSDs significantly improve boot times and overall system responsiveness when used to install the operating system.
 - **Applications:** Installing software on an SSD improves load times and overall application performance.
 - **Gaming:** SSDs are increasingly used in gaming PCs for faster load times and improved game performance.
 - **Laptops and ultrabooks:** Due to their speed, low power consumption, and smaller form factor, SSDs are preferred in portable computing devices.
-

8. Future of HDDs and SSDs

While **SSDs** have quickly become the standard for performance-oriented users, **HDDs** are still widely used due to their cost-effectiveness and ability to offer large storage capacities at lower prices.

As SSD prices continue to fall and capacities increase, SSDs are expected to gradually replace HDDs in most consumer devices. However, HDDs will continue to be popular for archival storage, backup, and large-scale storage solutions for the foreseeable future.

9. Exercises

Exercise 1: Fill in the blanks with the correct terms (HDD or SSD)

1. For faster system boot times and application loading, you should choose a(n) _____.
2. A _____ is ideal for large-scale data storage and archiving because of its lower cost per GB.
3. Due to its moving parts, the _____ is more prone to physical damage from drops or shocks.
4. If you need a drive with no moving parts and faster data access, the best choice would be a _____.

Exercise 2: True or False

1. SSDs have no moving parts, making them more durable and less prone to failure than HDDs. (True/False)
2. An HDD is typically faster than an SSD in terms of data read/write speeds. (True/False)
3. SSDs are usually more expensive than HDDs on a per-GB basis. (True/False)
4. HDDs are a better choice for portable laptops because they are faster and more power-efficient. (True/False)

Exercise 3: Matching Definitions

Match the terms with their definitions:

○Terms:

1. NAND Flash Memory
2. Platters
3. DRAM Cache
4. Controller
5. RPM

○ Definitions:

- a. The motor speed of HDD platters, measured in revolutions per minute.
- b. A processor in SSDs that manages data storage, retrieval, and wear leveling.
- c. A temporary storage component in some SSDs for faster data access.
- d. Circular disks in HDDs that store data magnetically.
- e. The primary storage medium in SSDs, organized in a grid of memory cells.

Exercise 4: True or False

Decide whether the following statements are true or false:

1. HDDs use spinning disks and a moving read/write head to store and retrieve data.
2. SSDs have higher power consumption than HDDs because they are faster.
3. M.2 SSDs are compact and connect directly to the motherboard.
4. HDDs are more durable than SSDs due to their mature mechanical design.
5. SSDs are ideal for applications like gaming and video editing.

Exercise 5: Fill in the Blanks

Use the words in the box to complete the sentences:

durability, capacity, PCIe, speed, noise

1. SSDs are silent because they produce no _____ during operation.
2. HDDs are preferred for users needing high storage _____ at a lower cost.
3. _____ SSDs provide extremely high read/write speeds, making them suitable for high-performance tasks.
4. SSDs are known for their greater _____, as they have no moving parts.
5. Faster data access _____ is one of the main advantages of SSDs over HDDs.

Exercise 6: Short Answer Questions

Answer the following questions:

1. What is the role of the actuator arm in an HDD?
2. Why are SSDs more energy-efficient than HDDs?
3. Name two form factors of SSDs commonly used in modern devices.
4. What type of tasks benefit most from using an SSD over an HDD?
5. Why are HDDs still used for data backups and archival storage?

Exercise 7: Comparison Table

Fill in the missing information in the table comparing HDDs and SSDs:

Feature	Hard Disk Drive (HDD)	Solid State Drive (SSD)
Speed	_____	Faster (200–5500 MB/s)
Power Consumption	Higher	_____
Noise	_____	Silent

Feature	Hard Disk Drive (HDD)	Solid State Drive (SSD)
Form Factor	3.5-inch, _____	2.5-inch, M.2, PCIe, U.2
Best Use Case	Large storage needs (e.g., backups)	_____

10. Conclusion

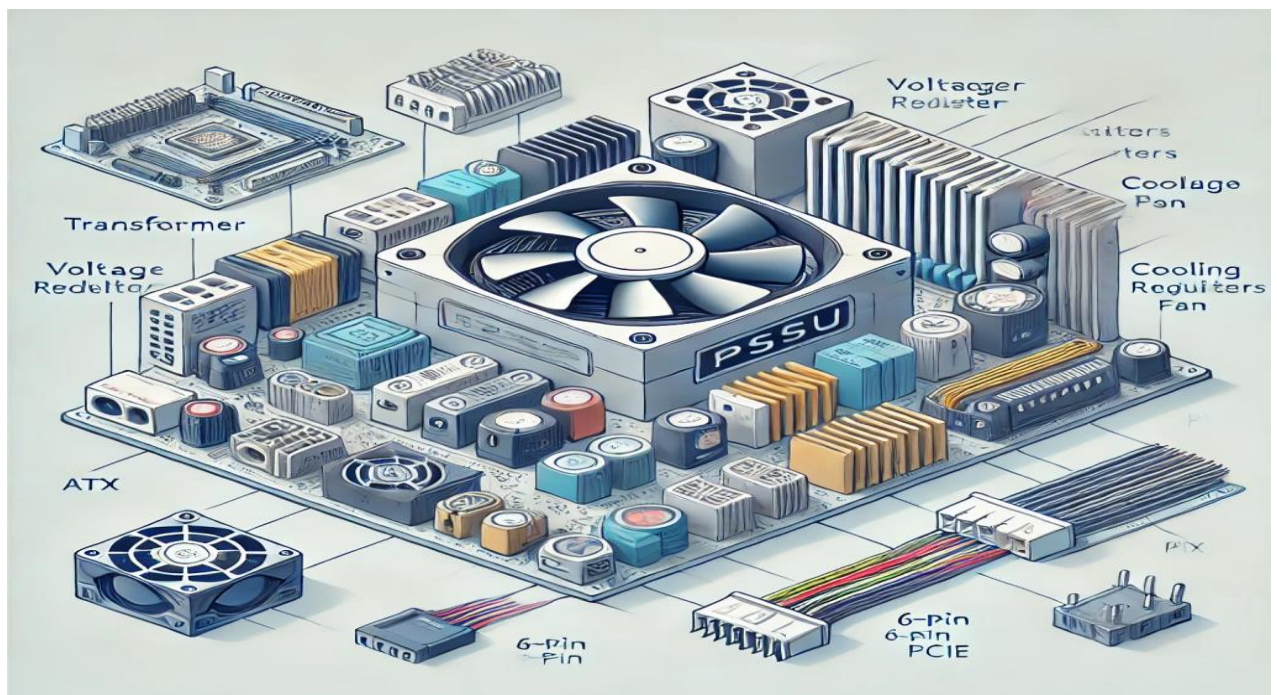
Both **HDDs** and **SSDs** serve as essential storage devices in modern computing. While HDDs offer larger capacities at a lower price point, SSDs provide significantly faster speeds, durability, and efficiency. Understanding the strengths and weaknesses of each storage device helps you make the best choice depending on your needs—whether it's for speed, storage capacity, or cost-effectiveness.

Topic 5: Power Supply Unit (PSU)

1. Introduction to Power Supply Unit (PSU)

The **Power Supply Unit (PSU)** is one of the most essential components in a computer system. Its primary function is to convert electrical power from an external source (typically the AC power from a wall outlet) into the DC (direct current) power needed by the computer's internal components, such as the motherboard, CPU, GPU, storage devices, and peripherals.

Without a reliable PSU, a computer cannot function. The PSU ensures that all internal components receive the appropriate voltage and current to operate efficiently. In addition to providing power, it also protects components from electrical damage by regulating and distributing power safely.



2. How a Power Supply Unit Works

The PSU takes in alternating current (AC) electricity from the power outlet and converts it to direct current (DC) electricity, which is required by the internal components of the computer. This conversion process involves several steps:

1. **AC to DC Conversion:** The PSU uses a **rectifier circuit** to convert the AC voltage from the wall outlet into DC voltage. This is the first step in the process.
2. **Voltage Regulation:** After the conversion to DC, the voltage must be regulated to ensure that it remains consistent and at the proper level. The PSU uses various **transformers** and **voltage regulators** to provide the correct voltage levels for the system.
3. **Distribution:** Once the correct voltage is generated, the PSU distributes it to the different components. The most common voltages supplied by a PSU are:
 - **12V:** For high-power components like the CPU and GPU.
 - **5V:** For the motherboard, storage devices, and some peripherals.
 - **3.3V:** For specific components on the motherboard, such as memory.
4. **Cooling:** PSUs usually contain a **fan** to help cool the internal components and prevent overheating. The fan is generally powered by the PSU itself and operates when needed to maintain a safe operating temperature.

3. Main Components of a Power Supply Unit

- **Transformer:** Converts AC voltage to a lower AC voltage suitable for the computer's needs.
- **Rectifier:** Converts AC into DC voltage.
- **Filter Capacitors:** Smooth out the voltage, removing any ripples and ensuring a steady DC output.
- **Voltage Regulators:** Ensure that the output voltage remains stable and does not fluctuate beyond acceptable levels.
- **Cooling Fan:** Prevents overheating of the PSU by circulating air.
- **Connectors:** Provide the necessary power connectors for the motherboard, CPU, GPU, storage devices, and other peripherals.

4. Types of Power Supply Units

There are several different types of PSUs designed for different use cases. The most common types are:

- **ATX Power Supply:**
The most common PSU type used in desktop computers. It follows the **ATX (Advanced Technology eXtended)** standard and is used in most home and office PCs. ATX PSUs typically provide power to the motherboard, CPU, storage devices, and peripherals.
 - **SFX Power Supply:**
A smaller form factor PSU typically used in compact or small form-factor (SFF) cases. SFX PSUs provide less wattage compared to standard ATX PSUs but are ideal for small build systems.
 - **Modular Power Supply:**
A modular PSU allows you to attach only the cables that are needed, reducing cable clutter and improving airflow within the case. These PSUs are useful in high-end or custom PC builds where cable management is a priority.
 - **Non-Modular Power Supply:**
In non-modular PSUs, all cables are permanently attached to the PSU, meaning you have to deal with cables that might not be used in your build. These are generally more affordable but may result in poorer cable management.
 - **Semi-Modular Power Supply:**
A compromise between modular and non-modular PSUs, where some cables are permanently attached, while others are modular.
 - **Redundant Power Supply:**
Used primarily in enterprise servers or high-availability systems, redundant PSUs provide backup power in case one PSU fails. Two or more PSUs operate simultaneously to ensure continuous power.
-

5. Key Specifications of a Power Supply Unit

When selecting a PSU for a computer build, several specifications are crucial to ensure that the PSU provides sufficient and stable power to all components:

- **Wattage:**
The most critical specification, wattage indicates the total amount of power the PSU can provide. It is typically rated in watts (W), such as **450W**, **600W**, **750W**, or even higher. The wattage needed depends on the power consumption of the components in the system. A higher wattage PSU provides more headroom for future upgrades or overclocking.
 - **Low-Power Systems:** 400W to 500W.
 - **Mid-Range Systems:** 600W to 750W.
 - **High-End Systems (gaming PCs, workstations):** 850W to 1000W or higher.

- **Efficiency Rating:**
The efficiency of a PSU measures how effectively it converts AC power from the wall into DC power for the computer. The higher the efficiency, the less energy is wasted as heat, which reduces power consumption and extends the PSU's lifespan. PSUs are usually rated with the following certifications:
 - **80 Plus Certification:** Indicates the efficiency of the PSU. PSUs with 80 Plus certifications (e.g., 80 Plus Bronze, Silver, Gold, Platinum, Titanium) are more energy-efficient.
 - **80 Plus Gold:** Typically means the PSU is at least 87% efficient at 20% load, 90% efficient at 50% load, and 87% efficient at 100% load.
- **Rails:**
Rails refer to the voltage lines that deliver power to different parts of the computer. Common rails include:
 - **12V Rail:** Powers high-demand components like the CPU and GPU.
 - **5V and 3.3V Rails:** Power the motherboard and peripheral devices like USB ports and storage devices.
- **Connectors:**
PSUs provide various connectors to supply power to the different components. Key connectors include:
 - **24-pin ATX Connector:** For the motherboard.
 - **4/8-pin CPU Power Connector:** For the processor.
 - **6/8-pin PCIe Power Connector:** For the graphics card (GPU).
 - **SATA Power Connector:** For storage devices like SSDs and HDDs.
 - **Molex Power Connector:** Less common now but still used for older devices and certain peripherals.
- **Form Factor:**
The form factor of the PSU must match the size of the computer case. The **ATX form factor** is the most common, but smaller form factors like **SFX** and **TFX** are also available for smaller cases.

6. Choosing the Right PSU

When choosing a PSU, it is essential to consider both your current and future needs. Here are some tips for selecting the right PSU:

1. **Determine Wattage:**
Calculate the power requirements of your components (motherboard, CPU, GPU, RAM, storage devices, etc.). You can use online PSU calculators to estimate the total wattage you need.
2. **Check Compatibility:**
Make sure the PSU is compatible with your motherboard (i.e., it has the correct connectors for the motherboard's power input).

3. **Efficiency:**

Choose a PSU with a high **80 Plus** rating (at least **80 Plus Bronze** or better) for better energy efficiency, lower electricity bills, and less heat output.

4. **Future-Proofing:**

If you plan to upgrade your system in the future (e.g., adding a powerful GPU), consider buying a PSU with higher wattage than your current needs.

5. **Modularity:**

If you prioritize clean cable management and airflow, consider a **modular** or **semi-modular PSU**. These allow you to connect only the cables you need.

7. Safety Features of a PSU

Modern PSUs include various safety features to protect both the PSU and other components of the system:

- **Overload Protection:** Protects the PSU from supplying too much power, which could cause overheating or damage.
 - **Overvoltage Protection:** Prevents the PSU from sending too high a voltage to the components.
 - **Short Circuit Protection:** Shuts down the PSU if there's a short circuit, preventing damage to the system.
 - **Overcurrent Protection:** Prevents too much current from flowing to the components, which could cause overheating or fire.
 - **Under-voltage Protection:** Prevents the PSU from supplying insufficient voltage to components, which could cause instability.
-

8. Common PSU Problems

- **Failure to Boot:** A faulty PSU can cause the system to fail to power up. If you hear no fan noise or the system shows no signs of power, the PSU may be the issue.
 - **Random Shutdowns:** If the PSU is not delivering stable power, it may cause the computer to shut down unexpectedly.
 - **Overheating:** If the PSU fan is clogged with dust or the PSU is not functioning efficiently, it can overheat, leading to poor system performance or potential damage to the components.
 - **Noisy Operation:** A noisy PSU fan can be a sign of wear, overheating, or the PSU failing to cool itself properly.
-

9. Exercises

Exercise 1: Fill in the blanks

1. The PSU converts _____ power from the wall outlet to _____ power needed by the computer components.
2. A PSU with a high _____ rating is more energy-efficient and generates less heat.
3. The most common PSU form factor for desktop computers is _____.
4. The _____ connector powers the CPU, while the _____ connector powers the graphics card.

Exercise 2: True or False

1. The PSU is responsible for converting AC power into DC power. (True/False)
2. A higher wattage PSU is always the best choice for any system. (True/False)
3. Modular PSUs allow you to detach unused cables for cleaner cable management. (True/False)
4. PSUs with low efficiency ratings waste more energy as heat, leading to higher power consumption. (True/False)

Exercise 3: Matching Terms

Match the components of a PSU with their descriptions:

- Components:
 1. Transformer
 2. Rectifier
 3. Voltage Regulators
 4. Cooling Fan
 5. 24-pin ATX Connector
- Descriptions:
 - a. Converts AC voltage to lower AC voltage suitable for a computer.
 - b. Ensures stable output voltage levels.
 - c. Converts AC power into DC power.
 - d. Connects the PSU to the motherboard.
 - e. Prevents overheating by circulating air.

Exercise 4: True or False

Decide whether the following statements are true or false:

1. The primary function of a PSU is to convert AC power to DC power for internal components.
2. Non-modular PSUs allow users to attach only the cables they need.
3. An SFX power supply is ideal for small form-factor cases.

4. PSUs with higher 80 Plus ratings are more energy-efficient.
5. Redundant PSUs are typically used in gaming PCs.

Exercise 5: Fill in the Blanks

Use the words in the box to complete the sentences:

efficiency, overheating, wattage, modular, protection

1. The _____ of a PSU measures how effectively it converts AC power to DC power.
2. A _____ PSU allows you to connect only the necessary cables, reducing clutter.
3. PSUs with high _____ ratings are recommended for energy-efficient systems.
4. Overload _____ prevents the PSU from supplying too much power to the components.
5. A clogged fan in the PSU can lead to _____, which may damage the system.

Exercise 6: Short Answer Questions

Answer the following questions:

1. What are the three most common voltage levels supplied by a PSU?
2. Why is the 80 Plus certification important when selecting a PSU?
3. Name two safety features included in modern PSUs.
4. What is the difference between modular and non-modular PSUs?
5. Which type of PSU is best for small cases, and why?

5. Exercise 7: Comparison Table

Fill in the missing information in the table comparing PSU features:

Feature	Modular PSU	Non-Modular PSU
Cable Management	Only required cables are connected	_____
Airflow	Better airflow due to reduced clutter	_____
Cost	_____	More affordable
Ideal Use Case	High-end or custom PC builds	Budget builds or standard systems
Future Proofing	_____	Limited by fixed cables

10. Conclusion

The Power Supply Unit (PSU) is an integral part of any computer system, providing the necessary power for all components to function correctly. Understanding how PSUs work, their specifications, and how to choose the right

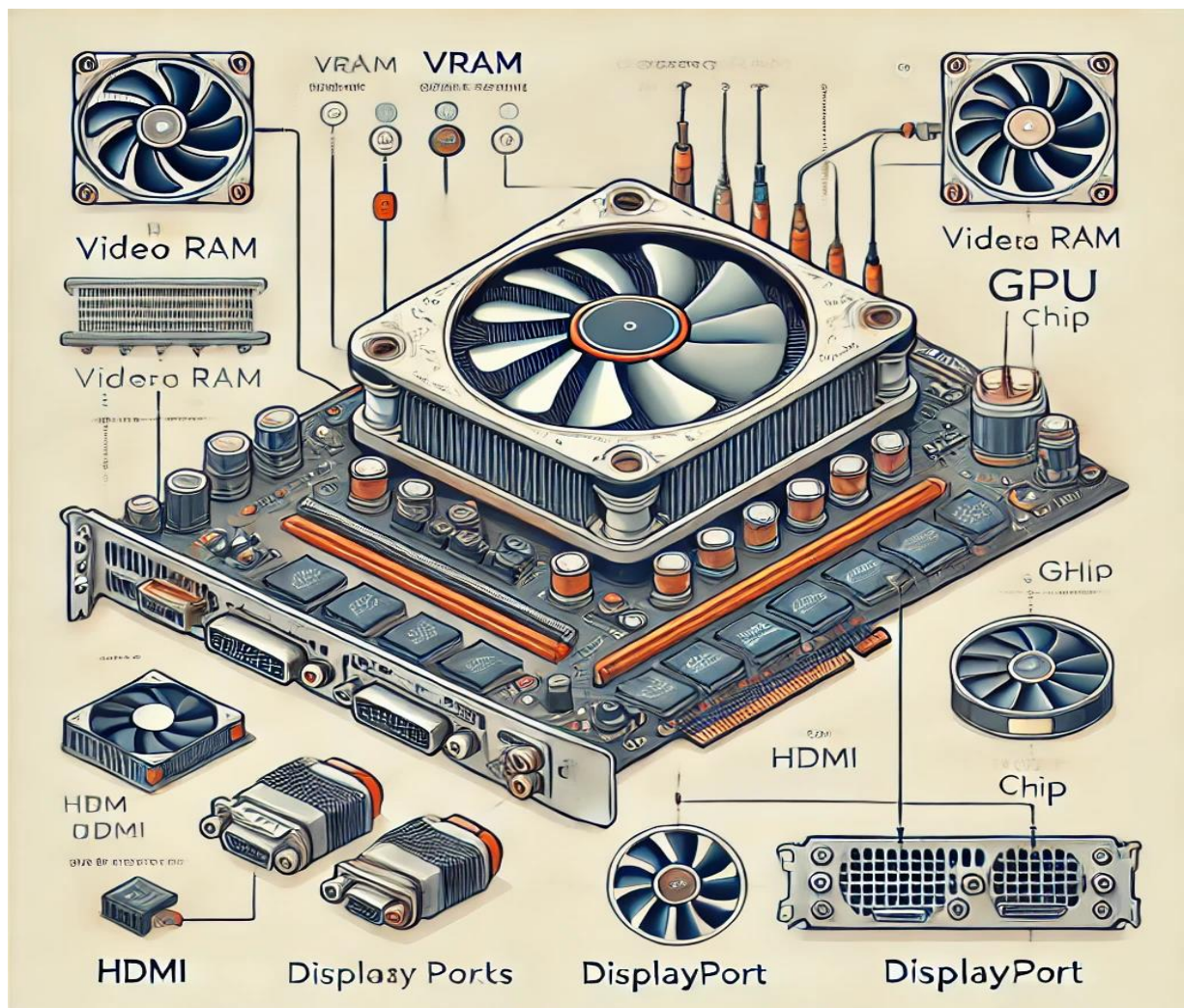
one is essential for building a reliable and efficient computer. When selecting a PSU, consider factors such as wattage, efficiency, and connectors to ensure it meets the power demands of your system. Always choose a high-quality PSU to protect your system from electrical damage and ensure stable performance.

Topic 6: Graphics Card (GPU)

1. Introduction to Graphics Card (GPU)

A **Graphics Processing Unit (GPU)**, often referred to as a **graphics card**, is a hardware component in a computer that is responsible for rendering images, video, and animations to be displayed on the monitor. The GPU handles all the computations necessary to produce the visuals and provides the processing power needed for graphical applications, from simple user interfaces to advanced gaming, video editing, and 3D rendering.

While the CPU (Central Processing Unit) is the general-purpose processor of the computer, the GPU is specialized in parallel processing tasks, especially those that require intensive mathematical calculations, like graphics rendering and machine learning.



2. How a Graphics Card (GPU) Works

A GPU works by processing and rendering graphical data, which is then sent to the monitor for display. Here's how it works in basic steps:

1. **Input from CPU:**
The CPU sends data about what needs to be displayed (e.g., graphics, textures, and models) to the GPU.
2. **Parallel Processing:**
Unlike the CPU, which processes tasks sequentially, the GPU is designed to process multiple tasks at the same time (parallel processing). This makes the GPU highly efficient for tasks like image rendering, where multiple calculations need to be done simultaneously.
3. **Rendering Process:**
The GPU processes the input data, performs various operations like shading, texturing, and lighting, and transforms 3D data into 2D images that can be displayed on the screen. This is achieved through the GPU's **shader cores** and other processing units.
4. **Display Output:**
After the image is rendered, the final graphical data is sent to the display via the GPU's video output ports (HDMI, DisplayPort, etc.).

3. Main Components of a Graphics Card

A typical graphics card consists of the following key components:

- **GPU Chip:**
The main processor of the graphics card. It contains multiple cores designed for high parallel processing. The GPU chip performs all the calculations and rendering.
- **Video Memory (VRAM):**
VRAM (Video RAM) is dedicated memory used by the GPU to store graphical data, textures, and frame buffers. It is much faster than regular system RAM because it is specifically designed for high-throughput tasks. VRAM capacity is often a critical factor in determining the performance of the GPU, particularly in high-resolution and resource-intensive applications.
- **Cooling System:**
GPUs can generate a lot of heat, especially during intense workloads like gaming or video rendering. To prevent overheating, graphics cards are equipped with cooling solutions, which usually include **fans**, **heat sinks**, or even **liquid cooling systems** in high-end models.

- **Power Connectors:**
Some high-performance graphics cards require additional power beyond what the motherboard can provide. They typically come with **6-pin** or **8-pin** PCIe power connectors to supply the extra power needed.
 - **PCB (Printed Circuit Board):**
The PCB holds the GPU chip, VRAM, power delivery system, and other components. The layout and quality of the PCB can affect the overall performance and cooling efficiency of the graphics card.
 - **Output Ports:**
Graphics cards include a variety of output ports such as HDMI, DisplayPort, DVI, and VGA, which allow users to connect to monitors, projectors, and other display devices.
-

4. Types of Graphics Cards

There are several types of graphics cards designed for different use cases:

1. **Integrated Graphics:**
Integrated graphics are built into the CPU or motherboard, rather than being a separate component. These are typically less powerful than dedicated graphics cards and are commonly used in budget systems, laptops, or systems where graphical performance is not a priority. Popular examples include **Intel UHD Graphics** and **AMD Radeon Vega** integrated into their respective processors.
 2. **Dedicated (Discrete) Graphics Cards:**
These are standalone graphics cards with their own GPU and VRAM. They offer significantly better performance compared to integrated graphics and are commonly used in gaming PCs, workstations, and professional graphics applications. Examples include **NVIDIA GeForce** and **AMD Radeon** series.
 3. **Professional Graphics Cards:**
These are specialized graphics cards designed for tasks such as 3D rendering, CAD (Computer-Aided Design), video editing, and scientific computing. They typically offer more stability, precision, and enhanced software support for professional applications. Examples include **NVIDIA Quadro** and **AMD Radeon Pro**.
-

5. Key Specifications of a Graphics Card

When selecting a graphics card, several specifications are important to consider:

1. **GPU Architecture:**
The architecture of the GPU determines its processing power and efficiency. For example, **NVIDIA's Turing** and **Ampere** architectures or **AMD's RDNA** and **RDNA 2** are different generations with varying levels of performance and features.
 2. **VRAM (Video RAM):**
VRAM is the dedicated memory that the GPU uses to store graphical data. The amount of VRAM is crucial for tasks like gaming, 4K video playback, or 3D modeling. Common VRAM sizes are **4GB**, **6GB**, **8GB**, or even **24GB** for high-end professional graphics cards.
 3. **Core Clock Speed:**
The core clock speed indicates how fast the GPU can process instructions, measured in MHz or GHz. Higher clock speeds can lead to better performance, but other factors like the number of cores and architecture play a more significant role in performance.
 4. **CUDA Cores / Stream Processors:**
CUDA cores (for NVIDIA GPUs) or **Stream Processors** (for AMD GPUs) are the individual processing units within the GPU. More cores generally mean better parallel processing capability, which is important for rendering and complex calculations.
 5. **Memory Bandwidth:**
Memory bandwidth refers to the speed at which data can be transferred between the GPU and VRAM. Higher memory bandwidth allows the GPU to access more data faster, which is especially important for tasks like gaming at high resolutions.
 6. **Interface:**
The GPU communicates with the motherboard via the **PCIe (Peripheral Component Interconnect Express)** interface. PCIe 3.0 and PCIe 4.0 are common versions, with PCIe 4.0 offering double the bandwidth of PCIe 3.0.
 7. **TDP (Thermal Design Power):**
TDP is the amount of heat a GPU generates under maximum load. A higher TDP typically indicates a more powerful GPU that requires better cooling solutions.
-

6. Choosing the Right Graphics Card

When choosing a graphics card, it's important to consider the intended use and budget:

1. **Gaming:**
For gaming, the GPU needs to handle the rendering of complex 3D environments, textures, and high resolutions. Common gaming GPUs

include **NVIDIA GeForce RTX 3060, RTX 3070, AMD Radeon RX 6700 XT**, and higher-end models like the **NVIDIA GeForce RTX 3080**.

2. **Professional Workstations:**

For professional use in fields like video editing, 3D rendering, or CAD, specialized GPUs like the **NVIDIA Quadro** or **AMD Radeon Pro** are ideal. These cards are optimized for precision and stability in professional software applications.

3. **Budget Systems:**

If you don't need high-end graphics performance, budget options like the **NVIDIA GeForce GTX 1650** or **AMD Radeon RX 550** provide decent performance for everyday tasks and light gaming.

4. **VR and 4K Gaming:**

For virtual reality or 4K gaming, a high-end GPU with plenty of VRAM and CUDA cores is essential. Cards like the **NVIDIA GeForce RTX 4090** or **AMD Radeon RX 7900 XTX** are designed for such high-demand tasks.

7. Common Uses of Graphics Cards

- **Gaming:**

Graphics cards are primarily used to render high-quality images and video for gaming. A powerful GPU can enable high frame rates, ray tracing, and smooth gameplay at high resolutions (1440p or 4K).

- **Video Editing and Rendering:**

Video editing software, such as Adobe Premiere Pro and DaVinci Resolve, uses the GPU for accelerating video rendering, real-time playback, and effects processing.

- **3D Rendering:**

Professionals in 3D modeling and animation use GPUs for rendering complex 3D scenes. Software like Autodesk Maya and Blender relies heavily on the GPU for these tasks.

- **Machine Learning and AI:**

GPUs are increasingly used in AI and machine learning for training deep learning models. The high parallel processing capability of GPUs makes them well-suited for handling the vast amounts of data required for machine learning.

- **Cryptocurrency Mining:**

GPUs are commonly used for cryptocurrency mining, particularly for coins like Ethereum. Mining requires intensive computational power, which is where the GPU excels.

8. Conclusion

The **Graphics Processing Unit (GPU)** is a crucial component of modern computing, providing the necessary power to render images, video, and animations efficiently. GPUs are essential for high-performance gaming, professional video editing, 3D rendering, and even scientific computing. When selecting a GPU, consider factors like performance, memory size (VRAM), architecture, and power consumption to ensure you get the best card for your needs.

9. Exercises

Exercise 1: Fill in the blanks

1. The primary function of a GPU is to render _____ and animations to be displayed on a screen.
2. The amount of memory a graphics card has is called _____.
3. _____ cores (for NVIDIA GPUs) or _____ Processors (for AMD GPUs) are the individual units responsible for processing graphical data.
4. High-end gaming and 3D rendering often require a GPU with more than _____ GB of VRAM.
5. A GPU communicates with the motherboard through the _____ interface.

Exercise 2: True or False

1. Integrated graphics are usually more powerful than dedicated graphics cards. (True/False)
2. VRAM is used by the GPU to store graphical data like textures and models. (True/False)
3. A higher number of CUDA cores always leads to a better GPU performance. (True/False)
4. GPUs are essential for tasks such as gaming, video editing, 3D rendering, and machine learning. (True/False)
5. Professional graphics cards like the NVIDIA Quadro are optimized for gaming. (True/False)

Exercise 3: Matching Terms

Match the GPU components with their functions:

- Components:
- 1. VRAM
- 2. Cooling System
- 3. GPU Chip
- 4. Output Ports
- 5. Power Connectors

- Functions:
 - a. Stores graphical data and textures for rendering.
 - b. Prevents overheating during intensive workloads.
 - c. The main processor responsible for rendering and calculations.
 - d. Connects the graphics card to displays like monitors or projectors.
 - e. Supplies additional power required for high-performance GPUs.

Exercise 4: True or False

Decide whether the following statements are true or false:

1. Integrated graphics cards are standalone components separate from the CPU.
2. VRAM is faster than regular system RAM and is optimized for graphical tasks.
3. GPUs are not used for machine learning or AI tasks.
4. High-end gaming requires GPUs with high VRAM and CUDA cores.
5. A GPU processes multiple tasks simultaneously through parallel processing.

Exercise 5: Fill in the Blanks

Complete the sentences with the correct terms from the box:

parallel processing, rendering, integrated, professional, VRAM

1. _____ graphics cards are built into the CPU or motherboard.
2. _____ tasks, such as 3D modeling, often require high-performance GPUs.
3. The GPU performs _____ to create 2D images from 3D data.
4. _____ is a type of memory used exclusively by the GPU for graphical tasks.
5. GPUs excel at _____ because they process multiple calculations at the same time.

Exercise 6: Short Answer Questions

Answer the following questions:

1. What is the main difference between integrated and dedicated graphics cards?
2. Name two types of professional tasks that heavily rely on GPUs.
3. Why is VRAM capacity important for gaming and 3D rendering?
4. List three common output ports found on modern GPUs.
5. What makes GPUs suitable for machine learning and AI?

Exercise 7: Comparison Table

Fill in the missing information in the table comparing GPU types:

Feature	Integrated GPU	Dedicated GPU	Professional GPU
Performance	Lower	_____	Optimized for stability and precision
Use Case	Everyday tasks, browsing, media	Gaming, video editing, 3D rendering	CAD, scientific computing, AI

Feature	Integrated GPU	Dedicated GPU	Professional GPU
	playback		
Memory (VRAM)	Shared with system RAM	_____	High capacity
Cost	Affordable	_____	Expensive
Example	Intel UHD Graphics, AMD Radeon Vega	NVIDIA GeForce RTX, AMD Radeon RX	NVIDIA Quadro, AMD Radeon Pro

10. Conclusion

The **Graphics Card (GPU)** is a pivotal hardware component for any computer that handles graphics-intensive tasks. Understanding how a GPU works, its key components, specifications, and use cases will help you make informed decisions when choosing a graphics card for your needs, whether it's for gaming, professional work, or computational tasks.

Рецензія-відгук

на посібник з англійської мови для студентів спеціальності «Комп'ютерна інженерія»

Зміст та структура

Посібник має чітку та логічну структуру, що охоплює основні аспекти, необхідні для вивчення технічної англійської мови студентами спеціальності «Комп'ютерна інженерія». Він починається з введення, що пояснює важливість технічної англійської для професійного розвитку, і продовжується розділами, присвяченими лексичним і граматичним аспектам.

Сильними сторонами є:

Розподіл за темами: кожен розділ детально розглядає окрему тему, наприклад, CPU, RAM, HDD/SSD, що допомагає студентам систематично засвоювати матеріал.

Практичні вправи: завдання охоплюють різні види діяльності (заповнення пропусків, рольові ігри, переклад тощо), що сприяє розвитку як письмових, так і усних навичок.

Оформлення

Матеріал представлений у легкому для сприйняття форматі.

Педагогічна цінність

Посібник пропонує збалансовану комбінацію теоретичних матеріалів і практичних завдань, що є важливим для закріплення знань.

Мова та стиль: текст написаний доступно, з урахуванням рівня підготовки студентів.

Актуальність: розглядаються сучасні технології, що відповідає потребам ринку праці.

Рекомендації: Розробити цифрову версію: інтерактивний посібник із завданнями, що перевіряються автоматично, упровадити глосарій: з основними термінами наприкінці кожного розділу.

Висновок

Посібник є корисним інструментом для студентів, які прагнуть оволодіти технічною англійською мовою. Він охоплює ключові теми, має зрозумілу структуру та сприяє розвитку професійних навичок.

Голова циклової комісії
«Комп'ютерна інженерія»



Людмила ЛИХОШВА

19.12.2024

Інформація про укладача:

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Основні інтереси:

- лінгвістичні та методологічні аспекти формування іншомовної компетентності здобувачів освіти;
- застосування ефективних технологій дистанційного навчання здобувачів освіти іноземній мові;
- дослідження спеціальної фахової термінології в іноземній мові.

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