

1.1 Hardware and Software

Syllabus 2026 - 2028

WHAT YOU NEED TO KNOW

- Hardware is the physical components of a computer system
- Internal components: CPU, processor, motherboard
- Internal memory: RAM and ROM
- Other hardware: graphics card, sound card, NIC, camera, internal and external storage, input and output devices
- Software is the programs that control the computer or process electronic data
- Applications software lets the user solve a task; system software lets the computer operate
- Characteristics of analogue and digital data, and the differences between them
- Why data must be converted: analogue to digital for processing, digital to analogue for controlling devices

Hardware

Hardware is the physical parts of a computer system, the parts you can touch. Hardware is either internal (inside the case) or external (connected to it).

Component	What it does
CPU / processor	The brain of the computer. It fetches, decodes and executes instructions and carries out calculations.
Motherboard	The main circuit board. All other components plug into it or connect through it so they can communicate.
RAM (random access memory)	Temporary, volatile memory that holds the data, programs and parts of the operating system currently in use. Contents are lost when power is off. Data can be read and changed.
ROM (read-only memory)	Permanent, non-volatile memory that holds start-up instructions (the boot-up). Contents are not lost when power is off and cannot normally be changed.
Graphics card	Processes image and video data and sends it to the monitor.
Sound card	Converts digital sound data to analogue signals for speakers or headphones, and sound from a microphone into digital data.
Network interface card (NIC)	Lets the computer connect to a network. Holds the MAC address.
Camera	Captures still or moving images as digital data.
Internal storage	Storage inside the computer, such as a hard disk drive (HDD) or solid-state drive (SSD).
External storage	Storage connected to the computer, such as an external hard drive, memory stick or memory card.
Input and output devices	Input devices send data into the computer (keyboard, mouse, microphone). Output devices present results (monitor, printer, speakers).

RAM compared with ROM

	RAM	ROM
Volatile?	Yes, data is lost when power is off	No, data is kept
Can it be changed?	Yes, read and write	No, read only
Typical use	Currently running programs and data	Boot-up instructions

	RAM	ROM
Size	Usually much larger	Usually small

Software

Software is the set of programs that control the operation of a computer or process electronic data. There are two types.

Type	Purpose	Examples
Applications software	Provides the services the user needs to solve a task.	Word processing, spreadsheet, database management system, control and measurement software, applets and apps, video editing, graphics editing, audio editing, computer aided design (CAD)
System software	Provides the services the computer needs to operate.	Operating system, device drivers, utilities, compilers, linkers

- **Operating system:** manages hardware, memory, files and the user interface
- **Device driver:** lets the operating system communicate with a hardware device such as a printer
- **Utility:** performs maintenance tasks, for example antivirus, backup, disk defragmenter
- **Compiler:** translates a whole high-level program into machine code before it runs
- **Linker:** combines separately compiled program parts into one executable program

Analogue and digital data

	Analogue data	Digital data
Nature	Continuous, can take any value in a range	Discrete, separate values (0s and 1s)
Examples	Temperature, sound, light, pressure, speed	Data stored and processed in a computer
Accuracy	Can show infinitely fine detail	Limited by the number of bits used
Processing	A computer cannot process it directly	A computer can process it directly

Why conversion is needed

- **Analogue to digital (ADC):** a computer only understands digital data. Readings from sensors such as temperature or light are analogue, so they are converted before processing
- **Digital to analogue (DAC):** a computer's digital output cannot directly drive many devices such as motors, heaters and speakers, which need analogue signals

EXAM TIP

Do not say 'hardware is the computer'. Define it as the physical components, then give examples. For RAM and ROM, always mention volatile or non-volatile; that is the mark most students miss.

Key terms

Term	Meaning
Hardware	The physical components of a computer system.
Software	Programs that control a computer or process data.
CPU	Central processing unit; executes instructions and does calculations.
Motherboard	Main circuit board that connects the components.
RAM	Volatile memory holding data and programs in use.
ROM	Non-volatile memory holding start-up instructions.
NIC	Network interface card; connects a computer to a network.
Applications software	Software that lets the user do a task.
System software	Software the computer needs to operate.
Device driver	Software that lets the OS communicate with hardware.
Analogue data	Continuous data that can take any value.
Digital data	Discrete data stored as 0s and 1s.
ADC / DAC	Converts analogue to digital / digital to analogue.