

UNIT 2 • SESSION 2

Components of a Computer System

Every machine you will ever use is the same few ideas wearing different clothes.

2ND SEMESTER • SCHOOL YEAR 2026-2027

Introduction to Computing • Prof. Ryan V. Labrador

Saturday, 22 August 2026 • 2-hour lecture

Two hours, four parts

Part 1	The system	The five components, the hardware/software line, and the IPO+S model
Part 2	In and out	Input devices, output devices, and the ones that do both
Part 3	The brain	Inside the CPU: control unit, ALU, registers, clock speed, cores
Part 4	Memory	Registers to cache to RAM to storage — and what each costs in pesos
After	Laboratory	Hardware identification stations, then your first HTML page

By the end of today you will be able to...

1

Name the five components of a computer system and say what each one contributes.

2

Draw the boundary between hardware and software, and place any device on the correct side.

3

Apply the IPO+S model to a real system, including one you use every week.

4

Explain what the control unit, the ALU and the registers each do inside a CPU.

5

Order the memory hierarchy by speed, size and cost, and justify the ordering.

6

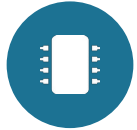
Read a spec sheet — RAM, storage, clock speed, cores — and say what it means in plain words.

PART 1

The system

Before the parts, the shape of the whole thing.

A computer system is five things



Hardware

The physical parts. If it can fall on your foot, it is hardware.



Software

The instructions. You cannot drop it, but nothing runs without it.



Data

What goes in and what comes out. The reason the system exists at all.



People

Users, operators, administrators. The most common point of failure.



Procedures

The agreed steps. Backup schedules, sign-in rules, who may do what.

Most people think 'computer' means only the first item. Four of the five are invisible.

Hardware and software

Hardware

- Physical, manufactured, has a serial number
- Wears out; can be dropped, burned, stolen
- Upgrading means buying and installing a part
- One unit is one unit — copying it costs money
- Fails gradually, then all at once

Software

- Instructions written by people, stored as files
- Does not wear out; it becomes outdated instead
- Upgrading means downloading and installing
- Copying it costs almost nothing — this is why licensing exists
- Fails exactly the same way every time you repeat the steps

Firmware sits on the line: software that lives permanently on a hardware chip.

Input · Process · Output · Storage



Input

Data enters the system.
Typed, tapped, scanned,
spoken, sensed.



Process

The CPU transforms it.
Calculating, sorting,
comparing, deciding.



Output

A result leaves the system.
A screen, a print, a sound,
a gate opening.

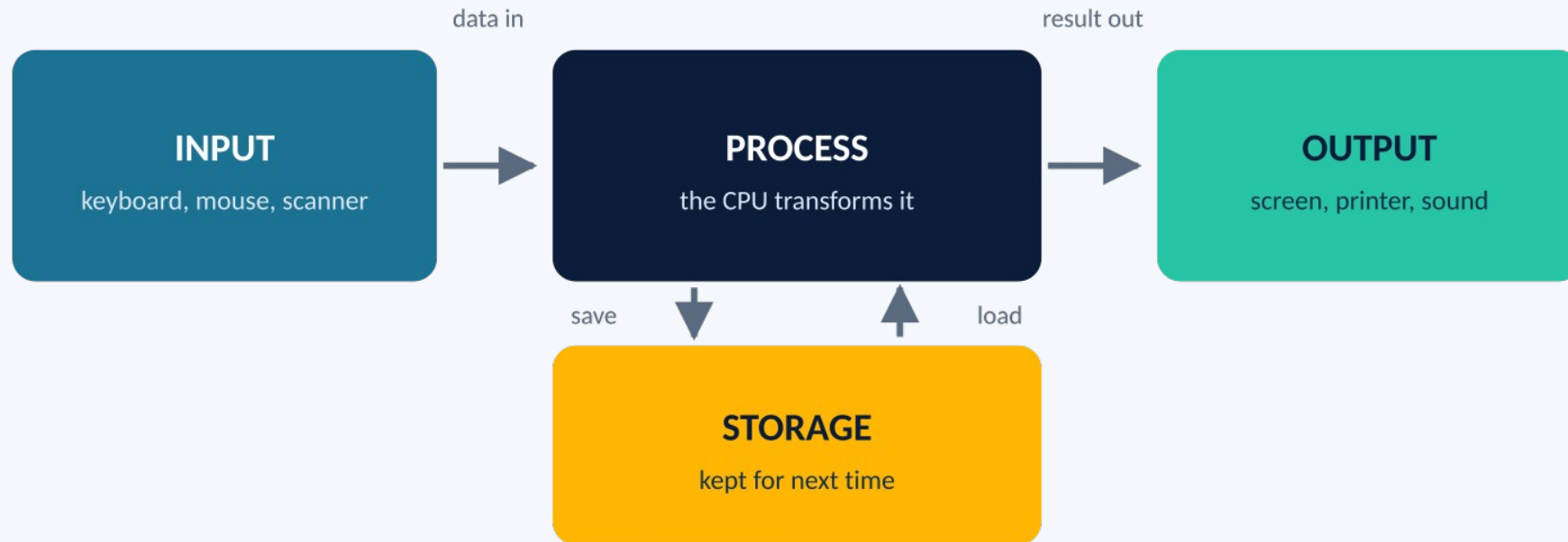


Storage

Data is kept for later.
Without this, every session
starts from nothing.

Every system in this course — every one — fits this model. Learn it once, use it all semester.

Where storage really sits



Storage sits under Process, not after Output — a system can save or reload at any point.

Copy this into your notebook now. You will redraw it for a different system in almost every session left this semester.

The MRT-3 turnstile

Input

You tap

The beep card touches the reader. A card number goes into the system.

Process

It decides

Is the card valid? Is the balance enough for this trip? Compute the fare.

Output

The gate opens

Barrier releases, remaining balance shows on the small display.

Storage

It is written down

Entry station, time and balance are logged for the end-of-day reconciliation.

I helped build this system. All of it is the four boxes on the previous slide.

PART 2

In and out

How data gets into a machine, and how it gets back out to you.

Devices that bring data in



Keyboard

Still the fastest way to enter text. Learn to touch-type; it compounds for forty years.



Mouse / trackpad

Pointing. Converts hand movement into coordinates on a screen.



Touchscreen

Input and output in one surface — the reason phones replaced the keypad.



Scanner

Turns a printed page into an image file. With OCR software, into editable text.



Camera / webcam

Light becomes a grid of numbers. Every photo you take is data entering a system.



Microphone

Sound pressure becomes numbers. This is how voice search and GCash voice OTP work.

Devices that push results back to us



Monitor

Millions of tiny lights. Resolution is how many; refresh rate is how often they update.



Projector

Same job, bigger surface, worse contrast. The one in this room is an output device.



Printer

Digital to physical. Inkjet for photos, laser for volume, thermal for receipts.



Speakers

Numbers become sound pressure again — the exact reverse of the microphone.



Headphones

Personal output. In a shared computer lab, these are a courtesy device.



Status lights

The humblest output: a green LED telling you the router is alive.

Devices that do both — and the word 'peripheral'



Both

Touchscreen

Displays the result and accepts the tap. One piece of glass, two jobs.



Both

Headset

Speaker in one direction, microphone in the other. Standard in every BPO seat.



Both

Network card

Sends and receives. Data leaves and arrives through the same component.



Both

External drive

You write to it and read from it — output and input, and storage as well.

Peripheral = any device attached to the computer rather than built into it. Not an insult.

PART 3

The processor

One chip, doing one small thing, billions of times a second.

Three parts of a CPU



Control Unit

The traffic officer. Fetches the next instruction, works out what it means, and tells every other part when to act. It does no arithmetic itself.



Arithmetic Logic Unit

The calculator. Adds, subtracts, compares, and answers true/false questions. Every decision your computer makes ends here.

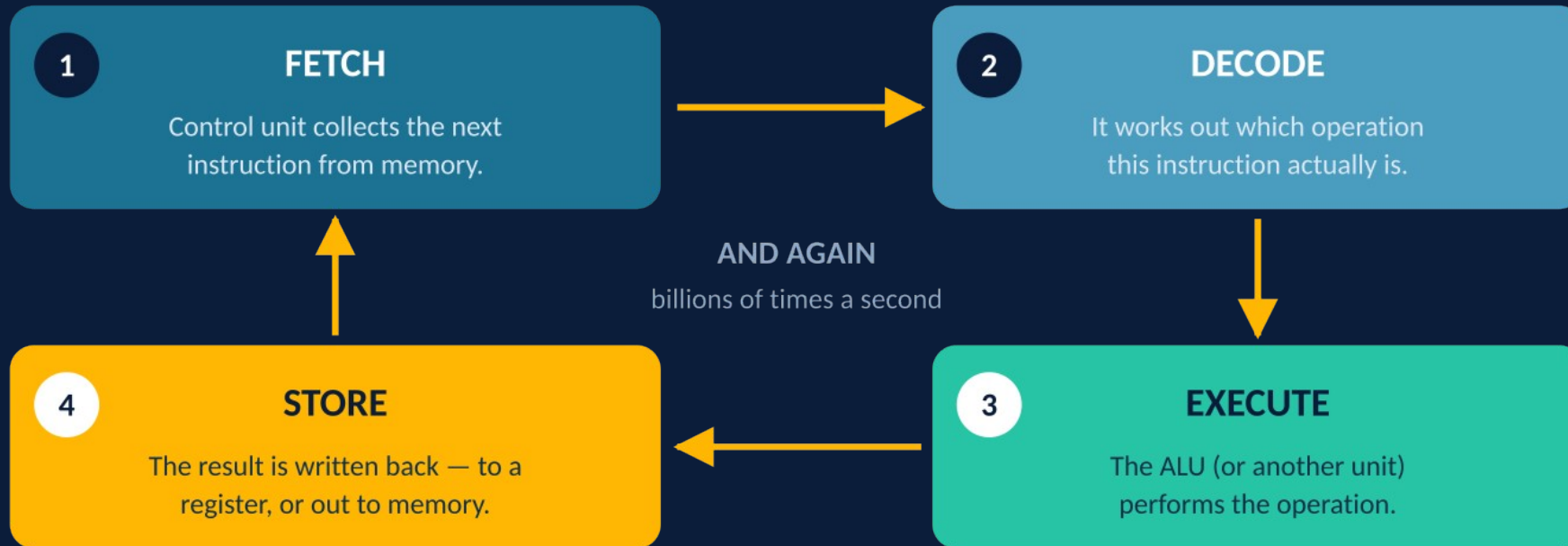


Registers

A handful of tiny slots inside the CPU holding the values being worked on right now. The fastest storage that exists, and the smallest.

A CPU cannot store your files and a hard drive cannot add two numbers. Different jobs.

Fetch · Decode · Execute · Store



Then it does it again. And again. Billions of times per second, for as long as the power is on.

Clock speed and cores



GHz

Clock speed

Cycles per second



Cores

Independent workers

Real parallel work



Threads

Queues per core

Not the same as cores

Clock

One number, one meaning

3.2 GHz means 3.2 billion cycles a second. Higher is faster only when comparing similar chips.

Cores

More hands, same speed

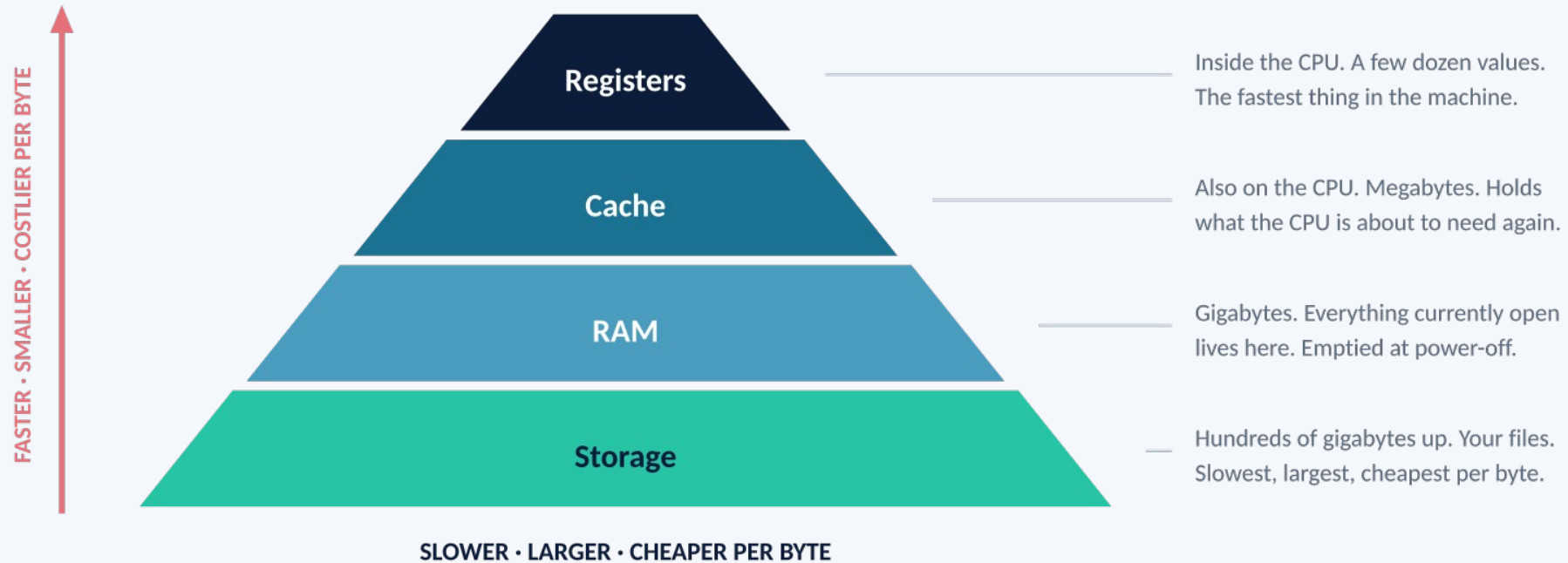
Eight cores can run eight jobs at once. One job that cannot be split gets no benefit at all.

PART 4

Memory and storage

Four kinds of remembering, each a trade between speed, size and price.

Fastest and smallest at the top



Going down the pyramid: slower, bigger, cheaper per byte. That trade-off is the entire reason the hierarchy exists.

RAM and ROM

RAM — volatile

- Random Access Memory: the working desk
- Holds whatever is open right now
- Read and written constantly, at high speed
- Loses everything the moment power is cut
- You can usually add more; it is the cheapest real upgrade

ROM — non-volatile

- Read Only Memory: instructions built into the machine
- Holds the firmware that starts the computer
- Written rarely, or never, after manufacture
- Keeps its contents with no power at all
- You do not upgrade it; at most you flash it

The unplug test: if pulling the plug erases it, it was volatile.

Hard disk or solid state

HDD — spinning disk

- Magnetic platters turning under a moving head
- Cheapest way to buy a lot of space
- Moving parts: vibration and drops can kill it
- Noticeably slower to open files and boot
- Still the sensible choice for bulk backup

SSD — flash memory

- No moving parts at all; memory chips only
- Costs more per gigabyte, less every year
- Survives being knocked; better for laptops
- Boots and opens files dramatically faster
- The upgrade that makes an old laptop feel new

Both are non-volatile. Both keep your files with the power off.

Four parts to price today

RAM

8 GB laptop stick

The cheapest upgrade that produces a real, felt difference on an old machine.

HDD

1 TB internal drive

Lowest cost per gigabyte. Best value when you need space, not speed.

SSD

512 GB internal drive

Costs more per gigabyte than the HDD, and transforms how the machine feels.

USB

64 GB flash drive

Convenience storage. Cheap, easy to lose, and never your only copy.

No prices printed here on purpose — in the lab you look up today's real listings and fill them in yourself.

Motherboard, buses and slots



Motherboard

The board everything plugs into. It does no work itself; it is the road network that lets every other part reach every other part.



Buses

The wires that carry the traffic. Data bus moves values, address bus says where, control bus says when and what kind.

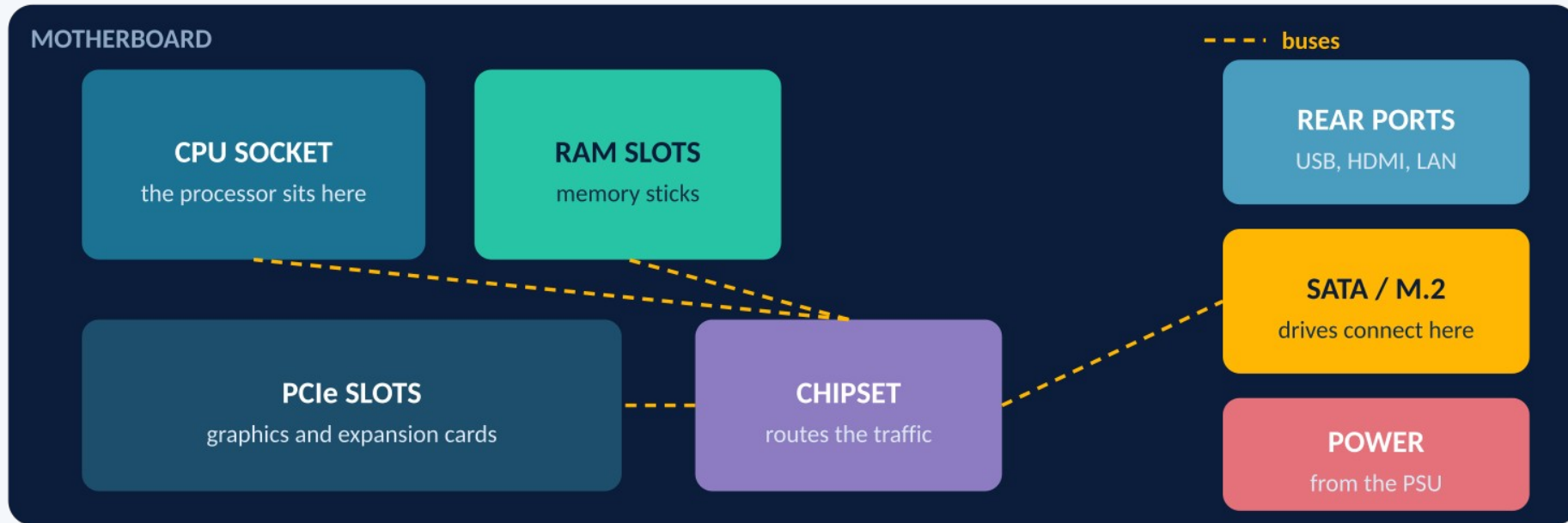


Slots and sockets

The standard openings: CPU socket, RAM slots, PCIe slots for cards, drive connectors. Standards are why parts from different makers fit.

Ports are next — and that finishes the hardware unit. Unit 2 ends today, in one session.

What is actually on the board



The motherboard does no work itself. It is the road network every other part uses.

The dashed lines are the buses. Every block on this board reaches every other block through them.

Ports you will actually meet



USB-A

The rectangular one. Keyboards, mice, flash drives. Only fits one way, eventually.



USB-C

Small, oval, reversible. Carries data, video and charging power over one cable.



HDMI

Video and audio to a monitor or projector. The cable behind this screen right now.



Ethernet (RJ45)

Wired network. Slower to plug in than Wi-Fi, and far more reliable.



3.5 mm audio

Headphones and microphones. Being removed from phones, alive on laptops.



Power

Not data at all — but the port that causes the most support calls.

The graphics card and the power supply

GPU

Graphics Processing Unit

Draws what you see. Thousands of small, simple cores doing the same operation to many pixels at once.

Also GPU

Not only for games

The same 'many small operations at once' shape is why GPUs run video editing and AI models.

PSU

Power Supply Unit

Converts wall AC into the low-voltage DC the board needs. Under-rated units cause random restarts.

Reality

Where budgets go wrong

People overspend on the GPU and buy the cheapest PSU. That is how you kill both.

Handling and static safety

1

Power off, unplug

Then hold the power button for five seconds to drain what is left in the board.

2

Ground yourself

Touch the bare metal case first. A wrist strap is better; your hand is what you have.

3

Hold by the edges

Boards and RAM by their edges. Never the gold contacts, never the chips.

4

Dry hands, dry table

No drinks on the bench. This is not a rule about tidiness.

5

No force, ever

Connectors are keyed. If it needs force, it is the wrong way round.

6

One part at a time

Put each screw where you can find it. Photograph the inside before you start.

HOLD ON TO THIS

Four things from today



One

Five components

Hardware, software, data, people, procedures. Four of the five are not metal.



Two

IPO+S

Input, process, output, storage. It fits every system you will meet this semester.



Three

The hierarchy

Registers, cache, RAM, storage — faster and smaller at the top, always.



Four

Volatile or not

If cutting power erases it, it is volatile. That one test answers most exam questions.

If you remember nothing else: IPO+S, and the memory hierarchy in order.

In the laboratory today



Station work

Identify real hardware

Six stations, rotating. Name the part, state its job, place it in IPO+S.



Build

My PC Spec Sheet

Your first hand-written HTML page, listing the machine you inspected.



AI task

Ask about CPU cache

Then mark every sentence in the answer that you cannot personally verify.



Next week

It goes live

Session 3: your group's page moves from your machine to a public web address.

Bring your notebook. Part of this lab is drawn by hand, not typed.

You now know what is inside the box.

Next Saturday we open the other half — the software that makes all of this metal do anything at all. And your group's website goes live on the public internet.

Questions?