

# Physics Doesn't Negotiate

Why basic sciences matter for engineers

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2023. Intel launches its 13th Gen Core i9. The fastest desktop chip it has ever shipped.

Flagship silicon. Marketed for gamers, engineers, and anyone who wanted the most performance money could buy.

# Then the crashes start.

Games crash mid-session. Compilers throw errors on machines that were rock solid a year earlier. For over a year, everyone blames motherboards, BIOS settings, game developers. Anyone but the chip.

# Mid-2024, Intel admits the cause.

To win the performance race, the chips ran at elevated voltages. Under sustained load, that voltage physically degraded the transistors inside. No software update could undo it. Intel extended warranties to five years just to contain the damage.

***"Fisika gak pernah kompromi. No diskon, no nego, no re-do."***

Nobody at Intel wanted this to happen. The chips didn't care how badly they wanted to win the benchmarks.

# One bedrock, three majors

Electrical, Biomedical, and Information Engineering are different programs.  
Underneath, they share the same foundation.

## **ELECTRICAL**

Electromagnetism, circuits, signals

## **BIOMEDICAL**

Physics + biology, applied to the body

## **INFORMATION TECH**

Physics of computation and energy

# **Engineering is creativity under constraint**

Not “anything is possible if you’re clever enough.” The best solution  
that fits inside what physics allows.

Intel's engineers weren't careless. They were some of the best in the world, working under intense competitive pressure.

Anyone can design something amazing assuming unlimited voltage headroom, zero material wear, infinite tolerances. That's fantasy, not engineering.

**The box is fixed. Your creativity inside it is not.**

ELECTRICAL

Maxwell's equations aren't exam material.

They're why your antenna radiates the way it does, why your motor spins, why signals leak into each other on a crowded circuit board.

**Ignore them, and your product doesn't ship.**

BIOMEDICAL

The body runs on real physics.

Bioelectric signals follow the same electromagnetism you're learning. Conservation of energy and mass govern drug delivery and metabolism. Biomechanics governs every prosthetic and implant.

**Ignore them, and your device hurts someone.**

Shannon's information theory sets a hard ceiling on how much data you can push through a noisy channel.

Computation itself has a physical energy cost. This is why chips overheat, degrade, and drain batteries.

**Ignore it, and your system doesn't scale.**

# Your basic science classes are not a warm-up

Fisika dasar and kalkulus this year are not hurdles between you and the “real” engineering classes. They are the real engineering classes.

Treat them as boxes to check, and you get blindsided later, like a team that shipped flagship chips that quietly wore themselves out. **Build real intuition now**, and years from now, you’ll be the one who catches the flaw nobody else sees.

***"Physics tells you the wall exists. Math tells you exactly where it is."***

Intel's engineers are some of the smartest in the world and physics still caught up with them.

# Thank you

Questions welcome