

IT Essentials - Chapter 3: Advanced Computer Hardware

1. BIOS, UEFI & POST

BIOS: Basic firmware that initializes hardware.

UEFI: Modern BIOS replacement, supports GUI and secure boot.

POST: Diagnostic test on startup to verify hardware status.

Beep codes indicate hardware issues.

CMOS battery stores BIOS settings.

Example: 3 beeps = RAM issue.

2. Power Management & Electrical Concepts

Formulas: $V = IR$, $P = VI$

Blackout: Power loss | Brownout: Low voltage

Protection: Surge Protector, UPS, SMPS

Example: UPS prevents restarts during brownouts.

3. CPU and Architecture

CPU: Executes instructions.

CISC vs RISC: Complex vs Reduced instruction sets.

Hyper-Threading, Multicore, Cache (L1-L3)

Cooling: Air, Liquid, Thermal Paste

Example: Quad-core CPU = 4 cores for multitasking.

4. RAID (Redundant Array of Independent Disks)

RAID 0: Fast, no redundancy

RAID 1: Mirroring

RAID 5: Parity + Striping

RAID 10: Mirroring + Striping

Example: RAID 5 survives one disk failure.

5. Ports, Interfaces & Connectors

Legacy: VGA, PS/2

Modern: USB (2.0 to Type-C), HDMI, DisplayPort, Thunderbolt, RJ-45

Example: HDMI carries video/audio to monitor.

6. Monitors & Display Types

Resolutions: 720p to 4K

Refresh Rate (Hz) | Response Time (ms)

Display: TN (cheap), IPS (quality), OLED (premium)

Example: Gamers prefer 144Hz monitors.

7. Storage Devices

HDD: Magnetic, large, slow

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SSD: Fast, expensive

NVMe: Super-fast via PCIe

Interfaces: SATA, M.2

Example: SSD boots OS faster than HDD.

8. Upgrades & Compatibility

Motherboard: Check form factor and socket type

RAM: DDR3-5, Speed in MHz, Dual/Quad channel

PSU: Match wattage, 80+ certified

Example: Add SSD for better performance.

9. Safety & Environmental Practices

E-waste: Recycle responsibly

MSDS: Hazard info

ESD Strap/Mat: Prevent static damage

Example: Store RAM in antistatic bags.