

Introduction to Computer Repair and Maintenance

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Study guide – key concepts, tools, procedures, and best practices

1. Why Maintenance Matters

Reason	What It Prevents	Typical Impact
Reliability	Hardware failures, data loss	Downtime, lost productivity
Performance	Slow boot, lagging applications	User frustration, reduced efficiency
Security	Malware, unpatched vulnerabilities	Data breach, system compromise
Longevity	Component wear, overheating	Early replacement costs

2. Core Components of a PC (Hardware Overview)

Component	Primary Function	Common Failure Modes
CPU (Processor)	Executes instructions	Overheating, thermal paste degradation
RAM (Memory)	Temporary data storage	Faulty modules, bad contacts
Motherboard	Connects all parts	Capacitor bulging, BIOS corruption
Power Supply (PSU)	Provides regulated power	Voltage spikes, fan failure
Storage (HDD/SSD)	Persists data	Bad sectors, controller failure
Graphics Card (GPU)	Renders video	Overheating, driver issues
Cooling System (fans, heatsinks, liquid)	Keeps temps in range	Dust buildup, fan wear
Peripheral Interfaces (USB, Ethernet, audio)	I/O connectivity	Port damage, driver conflicts

3. Safety First – Personal & Equipment

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1. Power Safety

- Unplug the unit or shut down the PSU switch before opening.
- Use a **grounded anti-static wrist strap** (or touch a metal chassis) to discharge static.

2. Tool Checklist

- Phillips & flathead screwdrivers (magnetic tips recommended)
- Precision tweezers, plastic spudger
- Cable ties / Velcro straps
- Multimeter (voltage/continuity)
- Thermal paste, cleaning alcohol (90%), lint-free wipes
- External boot media (USB/DVD) for diagnostics

3. Environmental Precautions

- Work on a clean, well-lit surface.
 - Keep liquids away from the workstation.
 - Maintain moderate temperature (20-25°C) and low humidity.
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4. Diagnostic Workflow (Step-by-Step)

1. Gather Information

- Ask the user for symptoms, recent changes, error messages.
- Document hardware specs (model numbers, serials).

2. Visual Inspection

- Look for swollen capacitors, burnt components, loose cables, dust accumulation.

3. Power-On Self Test (POST) Observation

- Listen for beep codes (refer to motherboard manual).
- Note any POST error messages on screen.

4. Basic Tests

- **Power** – Verify PSU output with a multimeter or PSU tester.
- **Memory** – Run **MemTest86** (bootable USB) for at least 2 passes.

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- **Storage** – Use manufacturer's diagnostic tool (e.g., Seagate SeaTools, Samsung Magician) or **CHKDSK** / **S.M.A.R.T.** data
- **CPU / GPU** – Stress test with **Prime95**, **AIDA64**, or **FurMark** while monitoring temps.

5. Software Diagnostics

- Boot into a clean environment (Windows Safe Mode, Linux Live USB).
- Check Device Manager for driver conflicts.
- Run **sfc /scannow** and **DISM** (Windows) for system file integrity.

6. Isolation

- Remove non-essential components (