UACE Sub - ICT

Topic 3: Computer Laboratory Care and Maintenance

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Presentation Outline

***UACE Sub – ICT* Topic 1:**

Introduction to Computing

- Sub Topic 1: Computer Literacy
- Sub Topic 2: Secure Laboratory Environment
- Sub Topic 3: Servicing and Maintenance of Computer Systems

Sub Topic 1: Computer Literacy

Sub topic Objectives:

- 1.1 Describing the booting process of a computer system.
- 1.2 Explaining the meaning of computer literacy.
- 1.3 System Startup.
- 1.4 Opening application programs.

1.1 Booting process of a computer system

- Booting is the process of loading the operating system (OS) from disk into working memory.
- Booting (also known as booting up) is the initial set of operations that a computer system performs when electrical power is switched on.
- The process begins when a computer or powered on and ends when the computer is ready to perform its normal operations.

Types of booting

- There are basically two types of booting:

1. Cold booting.

- This is the process of turning on a computer after it had been powered off completely.

2. Warm booting.

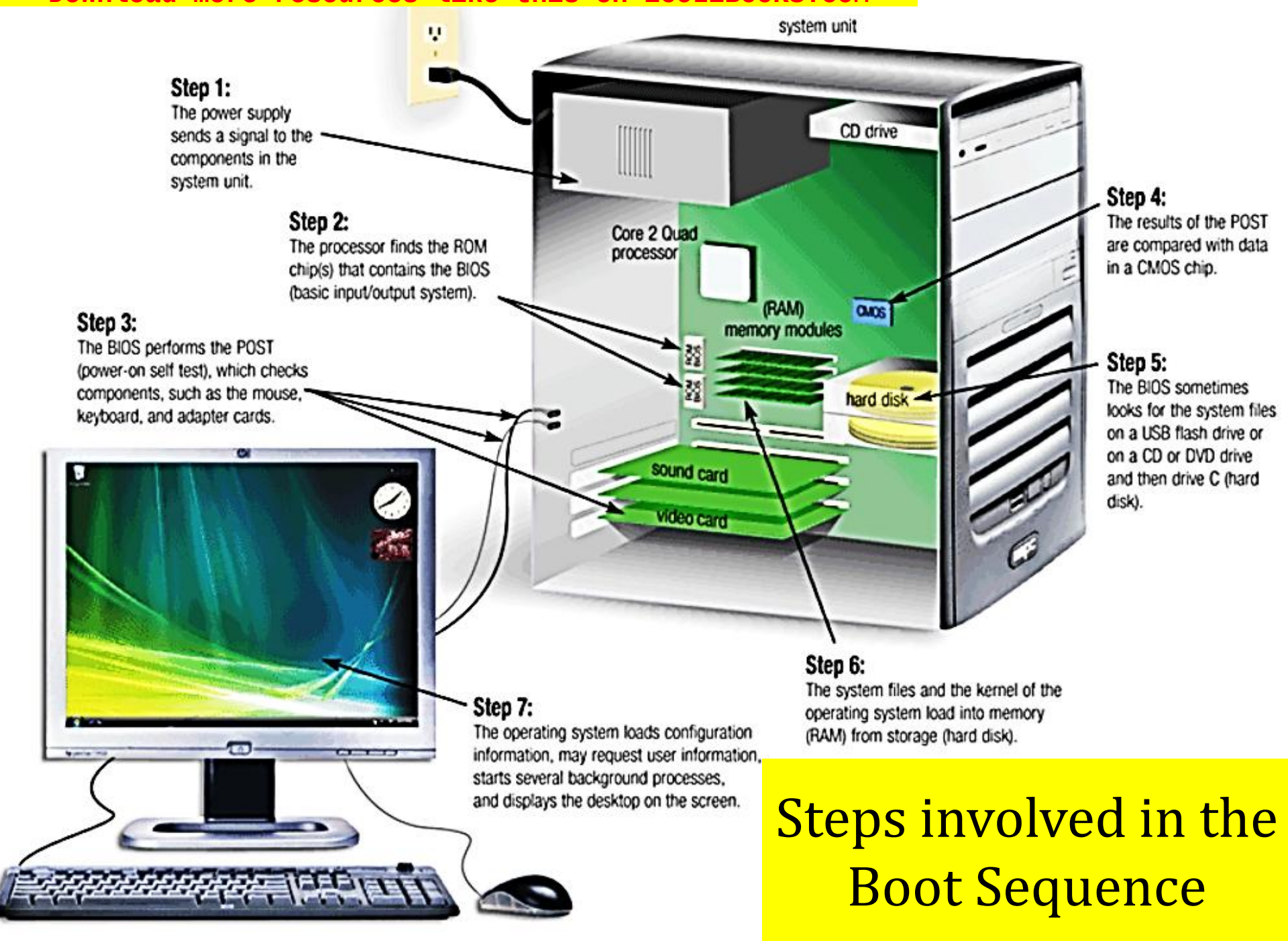
This is the process of restarting a computer that already is powered on.

Reasons for warm booting

- **New software installations:** When you install new software, often an on-screen prompt instructs you to restart the computer.
- **New hardware installations:** When some hardware devices like disk drives and printers are attached, the computer might request for a reboot to reload them effectively.
- **After Updating Software:** Computer software and operating system can trigger a reboot as well; more specifically, Microsoft Windows operating systems are outfitted with automatic updates that can be scheduled to run at a certain time and date; therefore, a reboot necessary in this case.

Reasons for warm booting (cont)

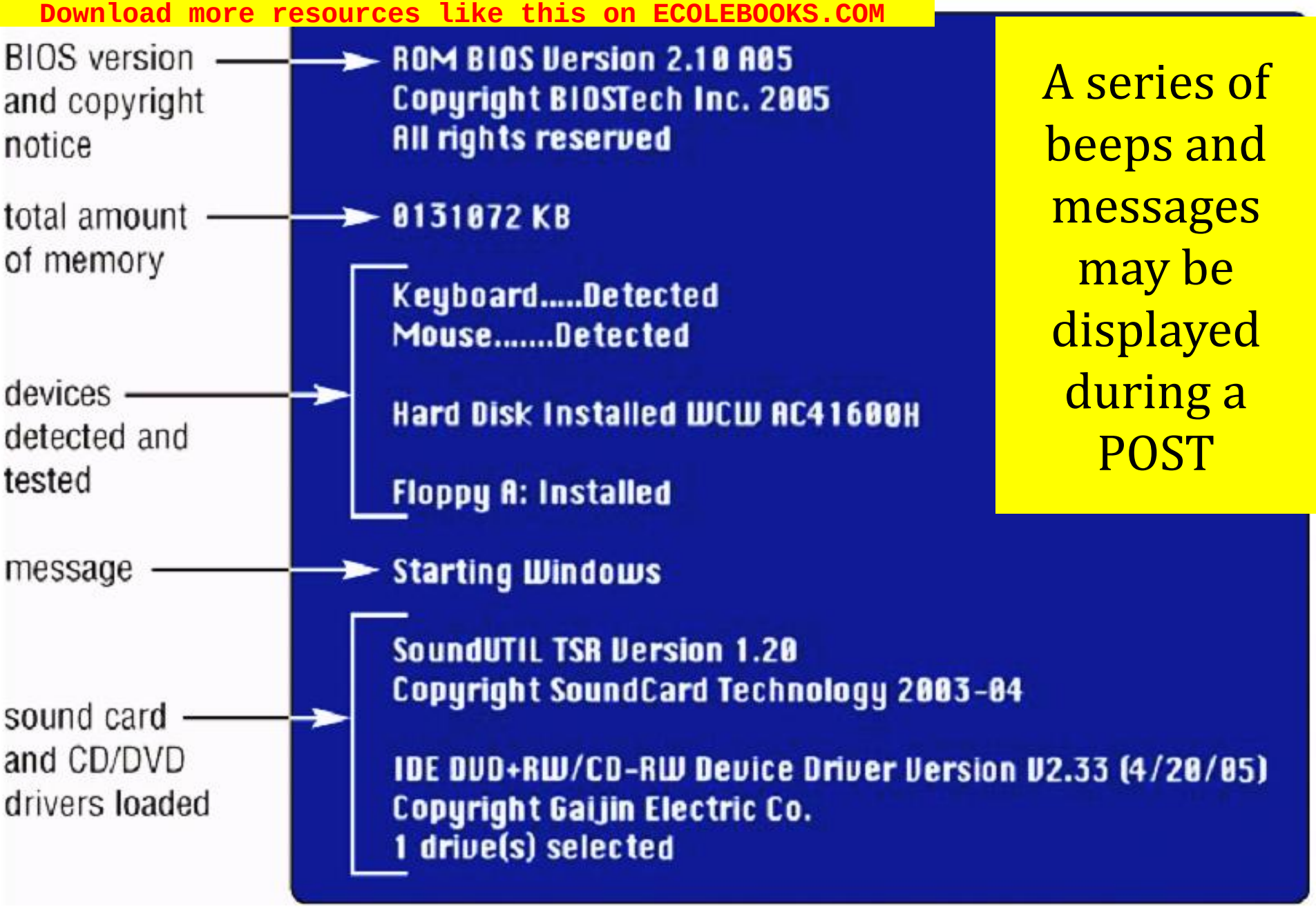
- **During Troubleshooting:** Rebooting may be used by users, support staff or system administrators as a technique to work around bugs in software. A warm boot is sometimes necessary when a program encounters an error from which it cannot recover.
- **Switching operating systems:** On a multi-boot system without a hypervisor, a reboot is required to switch between installed operating systems.
- **When the computer is freezing:** A warm boot can be necessary when the computer is responding slowly especially when many programs have been loaded into memory.



Steps involved in the Boot Sequence

Steps involved in the Boot Sequence

1. The power supply sends a signal to the components in the system unit.
2. The processor finds the ROM chip(s) that contain the BIOS (Basic input/output system).
3. The BIOS performs the POST (Power-On Self Test) which checks components such as the mouse, keyboard and adapter cards. A series of messages may display.
4. The results of the POST are compared with data in a CMOS chip
5. The BIOS looks for system files on the boot device.
6. The system files and the kernel of the Operating System load into RAM from the boot device.
7. The OS loads configuration information and displays the welcome screen.



A series of beeps and messages may be displayed during a POST

Booting: Further Definitions.

- A **boot loader** is a computer program that loads the main operating system or runtime environment for the computer after completion of self-tests.
- Examples of boot loaders include NTLDR, BOOTMGR, GNU GRUB, Syslinux, e.t.c.

Booting: Further Definitions.

- **Boot Devices / boot drive** is the device/drive from which the operating system is loaded.
- In most cases, drive C (the hard disk) is the boot drive.
- The computer BIOS (Basic Input/Output System) supports booting from various devices.
- These include the local hard disk drive, optical drive, floppy drive, a network interface card, and a USB device. The BIOS allows the user to configure a boot order.

1.2 Explaining the meaning of computer literacy

- **Computer literacy** is the ability to use computers and related technology efficiently.
- It's the level of familiarity with the basic ICT concepts that allows one to easily use personal computers.

To be considered computer literate, one needs to possess skills such as

- turning on the computer and log in, opening and creating folders and files,
- Word processing,
- Spreadsheets skills,
- Browser basics (Internet and Email),
- Basic hardware terminology,
- Virus and security awareness.

Advantages of Computer Literacy

- **Profitable Skills:** The ability to use more common programs such as Microsoft Word can aid one to make money or get hired for a higher-level job when other candidates do not have the skills.
- **Leadership and Promotions:** Computer literacy skills may get one promoted to a higher position within your workplace or be put in a leadership position in which you teach others how to use computers or certain computer programs.
- **Work Performance:** Knowing how to use a computer often allows you to get work done in a more organized, efficient and timely manner
- **Communication:** Knowledge of how to access the Internet on a computer opens up different possibilities for you to communicate with coworkers or supervisors.
- **Being prepared For the Future**; Computer technology is advancing faster, so if you are familiar well with computer skills now this will makes you ready for bright future.

Advantages of Computer Literacy

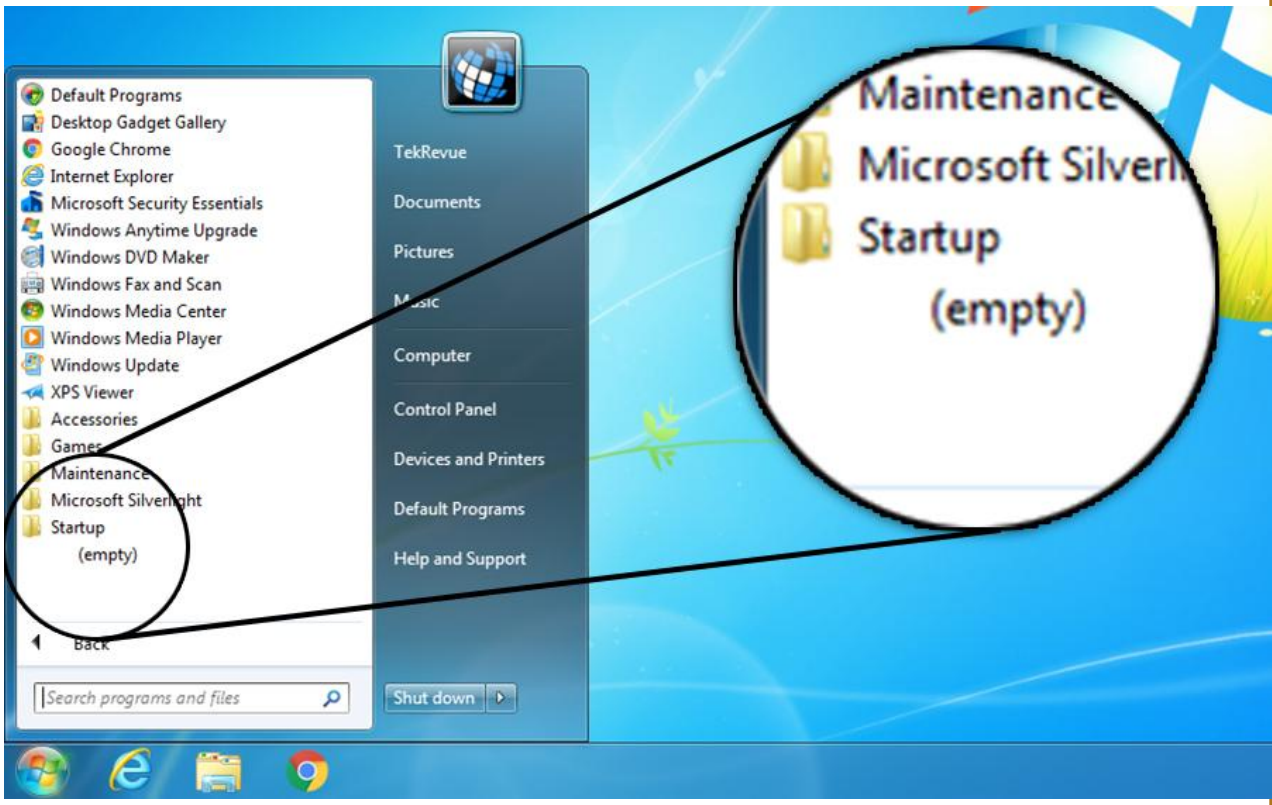
- **New Media**; computers are replacing television, whether take an example of many young people or just our Teenagers.
- **More job opportunities**; since almost all workplaces use computers therefore need for person having computer skills is really in great demand….
- **Staying up to date**; in the modern world, it is easier to hear or read about the latest news through computer websites.
- NB: A **digital divide** is inequality with regard to access to, use of, or impact of information and communication technologies (ICT). Is can be a result of having two societies one with very high levels of computer literacy and the other lagging far behind.

1.3 System Startup

- On start up, the OS may verify that the person attempting to use the computer is a legitimate user through use of a password.
- After the user logs on, the desktop and icons are displayed on the screen.
- Finally, the operating system also executes programs in the Startup folder, which contains a list of programs that open automatically when you boot the computer.
- Microsoft Windows users can see each of the programs that startup each time their computer boots by using the msconfig utility.

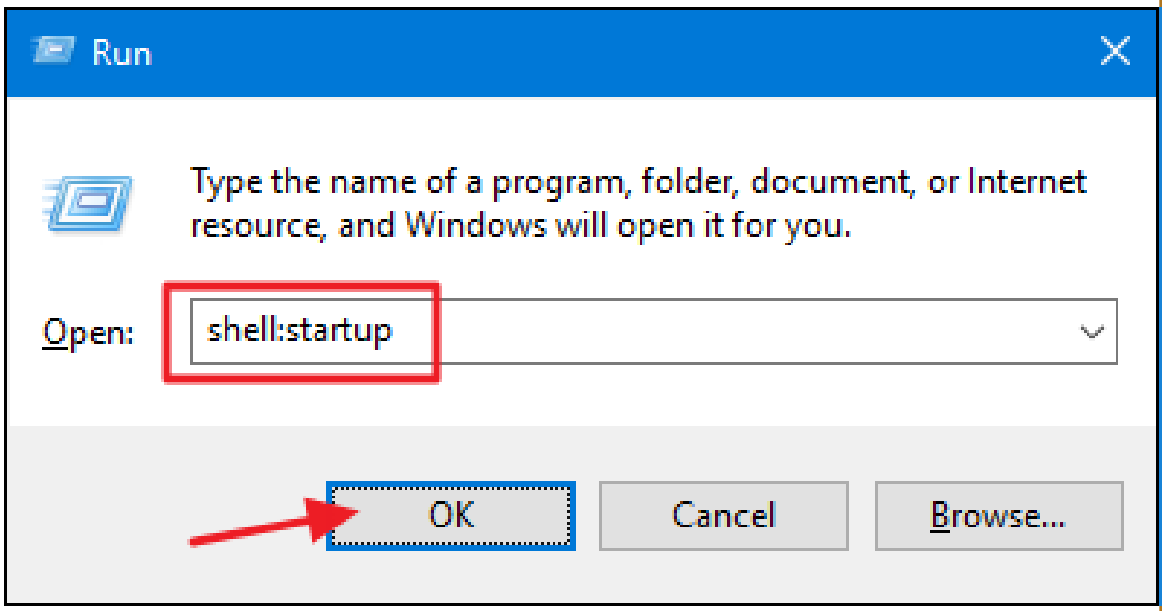
The Startup Folder

- The Startup folder in Windows contains a list of shortcuts of those applications that start when your Windows start.
- On Windows 7, you could easily access the startup folder from Start Menu > Startup.



The Startup Folder

- To open the “Startup” folder the easy way, just hit Windows+R to open the “Run” box, type “shell:startup,” and then press Enter.



- To manage all startup programs (even those not listed in the startup folder), you can launch the msconfig by hitting Windows+R to open the “Run” box, and typing the “msconfig” command.

1.4 Opening application programs

- An application is defined as a computer program designed to help people perform a certain type of work. Examples of applications include word processing programs, spreadsheets, media players, and even games.

- You can open, or launch, a program by using any of the following methods:

1. Double-click a program shortcut icon on the desktop.

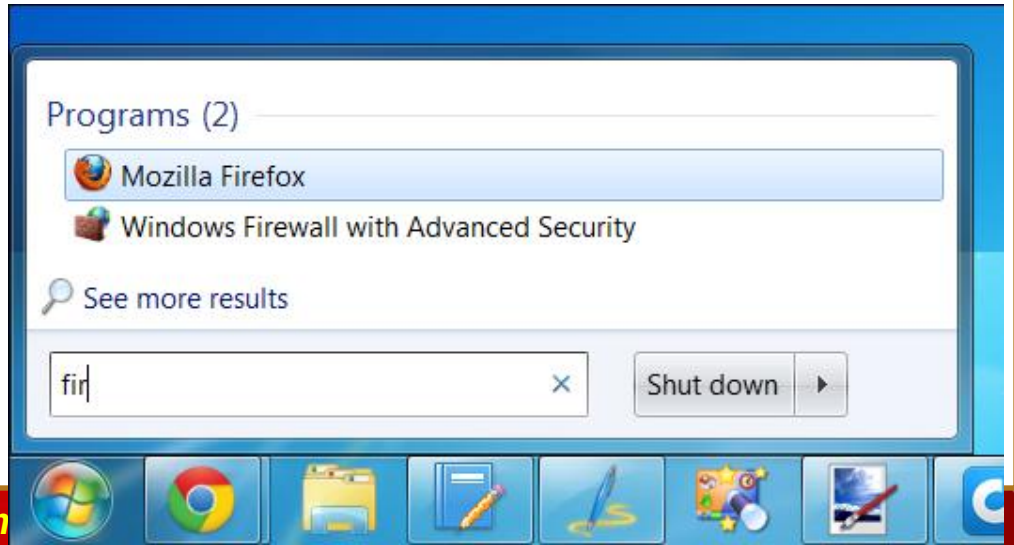
2. Click an item on the taskbar.
3. Choose Start→All Programs. Click the program name on the All Programs list that appears.
4. You can use the Start menu's search feature to launch a program.

1.4 Opening application programs

5. On Windows 7, you can press the **Windows key along with a number** to quickly launch the corresponding application on your taskbar.

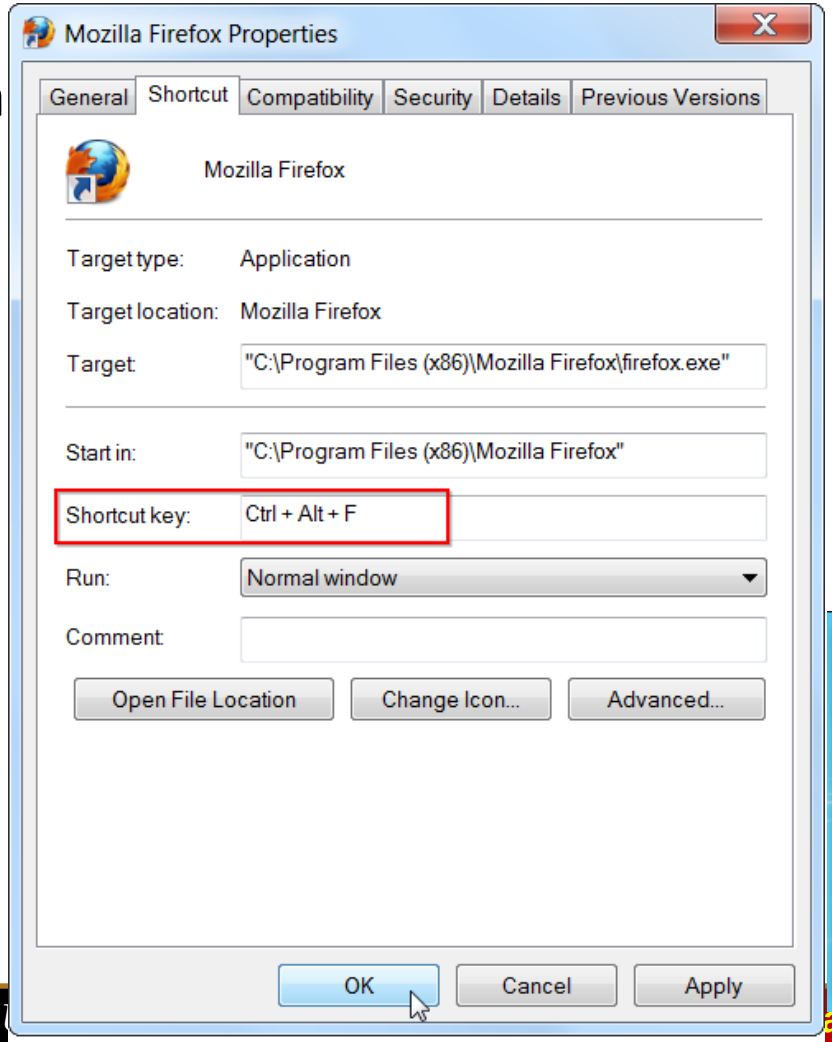
- For example, WinKey+1 launches the first application pinned to your taskbar.

6. You can use the **Start menu's search** feature to launch a program with just a few key presses.



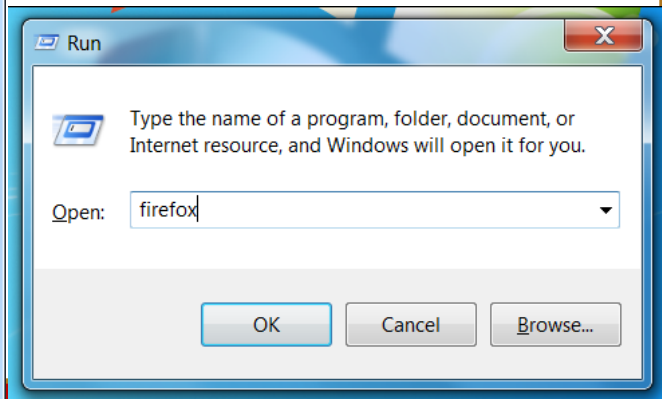
1.4 Opening application programs

7. If you launch an application frequently, you can assign a **custom keyboard shortcut** to it. First, locate the application in your start menu or on your desktop, right-click its shortcut, and select Properties.



8. You can also use the **Run dialog** to quickly launch applications. Open it by pressing WinKey+R.

- In the Run dialog, type the name of a program's .exe file and press Enter to launch it.



Sub Topic 2: Secure Laboratory Environment

Sub topic Objectives:

- 2.1 identifying areas of laboratory security.
  - physical security
  - electric power security
  - security cameras
  - first aid boxes
  - fire extinguisher
  - air conditioning, etc.
- 2.2 Safe use of the computer laboratory.
- 2.3 preparing laboratory rules and regulations

A Computer Laboratory

- A computer laboratory is a room that is specially designed and prepared to provide a safe and conducive environment for using computer systems.

Factors to consider when preparing a computer laboratory

- Security of computers, programs and other resources
- Reliability of the power source
- The number of computers to be installed and the available floor space
- The maximum number of users that the computer laboratory can accommodate
- Strength of available furniture

2.1 Areas of laboratory security

- Organizations, libraries, and schools running public computer labs face a variety of complex computer security challenges. These institutions take measures to ensure the safety of the equipment, software, data and users.

(a) Physical security measures

- Burglar proofing avoid unauthorized access to computer room.
- **Fit strong locks**, doors, windows and roofing. Security should be good around computer room to avoid thefts.

Physical security

- Employ security guards to keep watch over data and information centers.
- Apply burglar proof for the computer laboratory by reinforcing weak access points like windows, doors, roofing with metal grills and strong padlocks.
- Set up alarms to alert you in case of break-ins.
- Use system locks (locked key systems) to make it difficult to access internal components like hard disks and memory sticks.
- Use cables to lock the equipment to desk, cabinet or floor.
- Electronic locking mechanism with keys, swipe cards, finger print recognition.
- CCTV Cameras to keep watch over computer systems and centers.

Security camera

- Security cameras act as a deterrent to theft and other crimes. Cameras monitor data centers or blind spots outside of doors.
- IT computer labs are monitored either in person by a lab technician, or remotely through security

Burglar proofing

- Burglar proofing provides protection against any forced physical entry into the computer laboratory.
- Burglar proofing involves fitting metal grills in windows and doors.

Burglar proofing

- Consider installing security alarms at strategic access points that would alert the security personnel in case of a break-in.
- Fit strong metallic grills and locks on doors, windows and strengthen the roof incase the roofing is weak.
- Use Desktop locks, system unit enclosures and laptop locks.

Electric power security

- Electric power security: Place no more than two computers on each circuit. Do safe well insulated cabling.
- Keep the circuits for computer systems separate from all other equipment such as printers, copiers and coffee makers.
- Plug each computer into a surge protector or UPS (Un interruptible Power Supply Unit).

Electric power security

Stable power supply

Protect computers from being damaged and data loss due to power instabilities by having:

- Power stabilizers maintain power at required voltages.
- A surge protector can be used to protect computer equipment against under voltage and over voltage.

Electric power security

UPS- Uninterruptible Power Supply

- Computers need the time to shut down properly. Damage to devices and data can occur when there is sudden power loss or fluctuation.
- **UPS**, or **Uninterruptible Power Supply units**, keep backup power for devices in the event of a failure or other electrical problems.
- A UPS is essentially a small battery that keeps the power supply on for long enough for you to switch off the computer safely

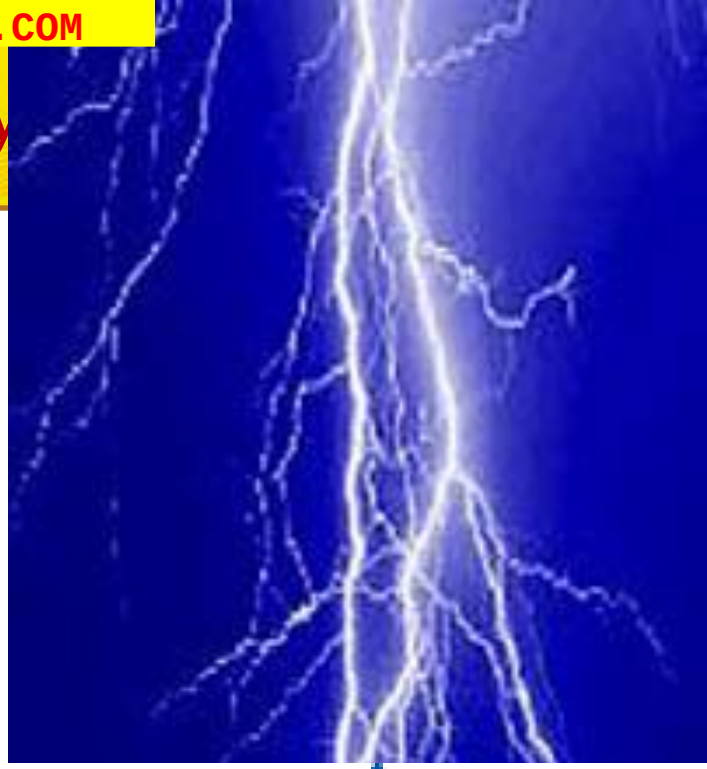
when there is a sudden blackout.

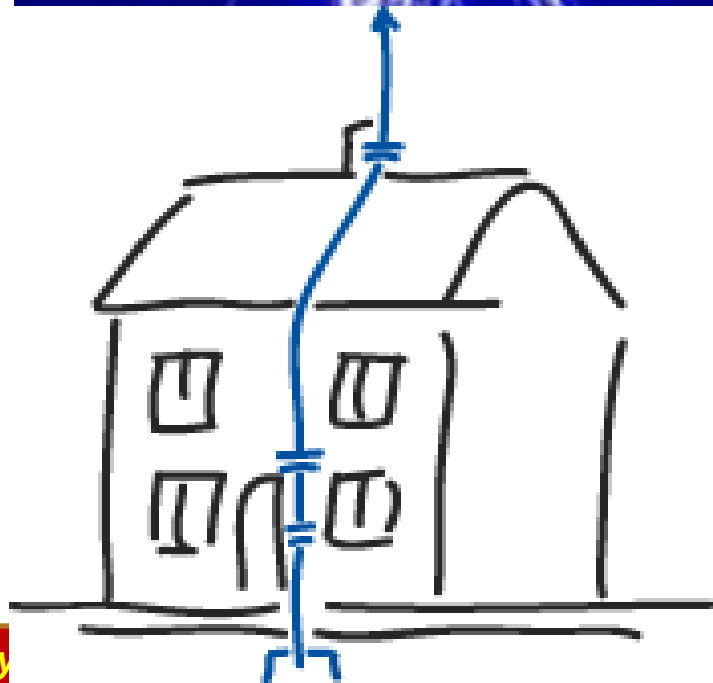
Electric power security

- **Cable insulation:** All power cables must be properly insulated and laid away from pathways in the room.
- Lay them along the walls in trunks. This prevents electric shock and power disconnections caused by stumbling on cables.

Electric power security

Always install
lightening conductors
to the computer
laboratory to protect
the machines and the
users of the
computers.





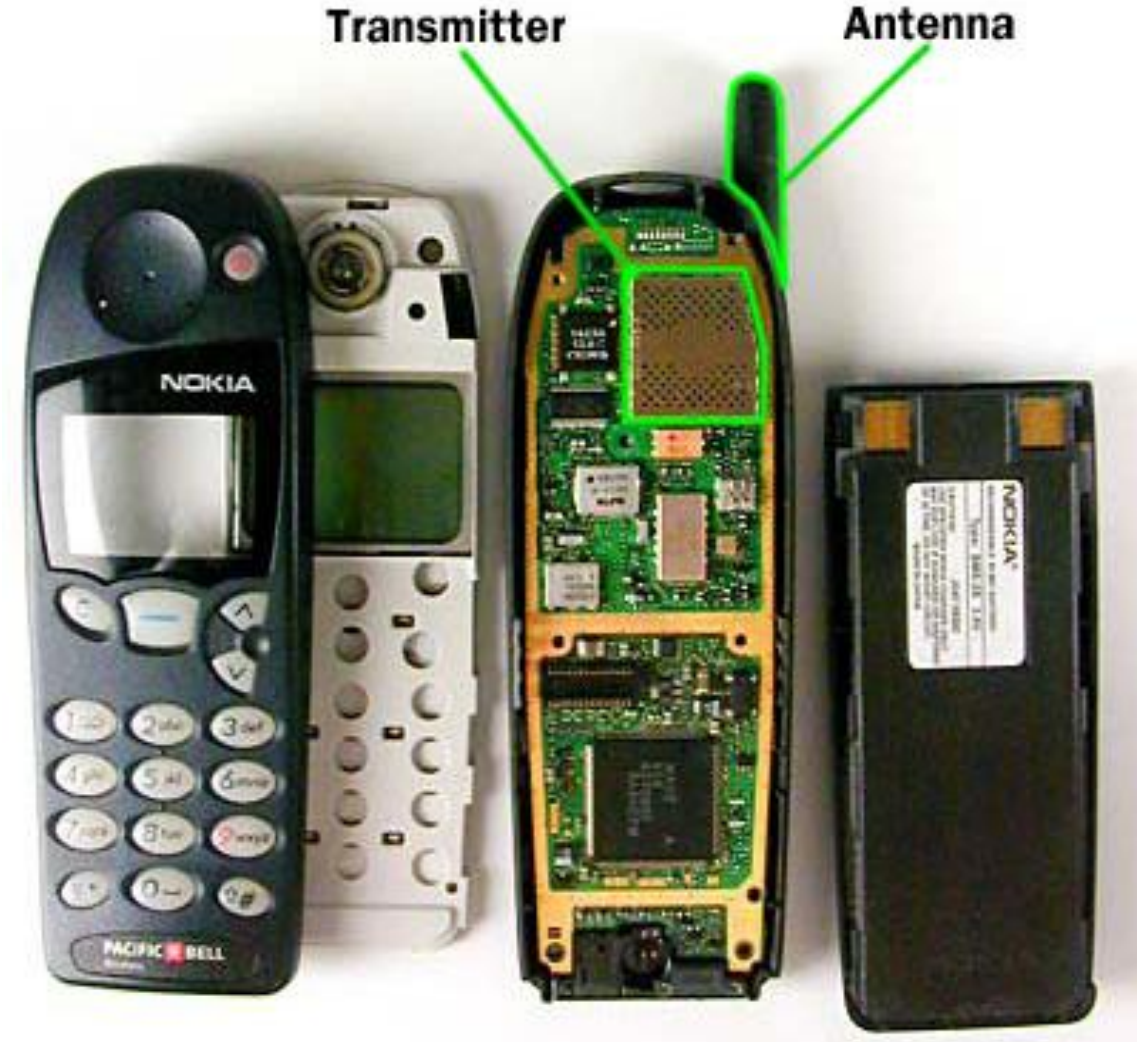
Electric power security

Minimize Electrical noise / interferences in the computer environment.

- Definition:
  - ELECTRICAL NOISE refers to externally radiated signals that cause undesirable additions to the current voltage.

Electric power security

- Electrical noise is commonly generated by devices like Fluorescent lights of high frequency, Motors, Battery Chargers, Inverters, Radios, television, and Cell phones.



First aid boxes

- **First aid box:** A first aid kit is a box or bag that contains the necessary items for providing care in case of any emergency in the computer lab such as a electric shocks.
- Tool kits are also necessary for *securing ICT repair and maintainace tools*

Fire extinguisher

- Fire extinguishers are a critical component of saving property and lives in the case of a fire emergency.
- Owning a fire extinguisher is a form of ensuring safety.
- All computer rooms need it just in case a fire starts.
- It can save our property from burning because the use of the device will help prevent it from spreading and can even stop the flame in no time.

Fire extinguisher

Have gaseous fire extinguishers like those filled with carbondioxide. Water based or powder extinguishers should be avoided since they can cause damage to computer components.

Heating, Ventilation and Air Conditioning (HVAC)

- Air conditioning units monitor and maintain the temperature, air distribution and humidity in a computer room.
- An Air conditioning unit is a device used for cooling and controlling the humidity and purity of the air circulating in a space.

Heating, Ventilation and Air Conditioning (HVAC)

- Have good air circulation in the computer room since users and computers emit heat energy.
- This is possible through having enough ventilation points like windows, installing an air conditioning system.
  - Avoid overcrowding of machines and users.
  - All the above prevent suffocation and overheating.

Heating, Ventilation and Air Conditioning (HVAC)

- Avoid direct sunlight and high Temperatures that may damage hardware components.

  Ventilation should be good. Good aeration enables the computer to cool and hence avoids overheating

Dump Control: Humidity must be regulated in the computer laboratory to remain at an optimum 50%.

- Low humidity may cause static electricity to build and damage sensitive components.
- High Humidity of over 70% may cause rusting of the metallic parts of the computer system.

Dust Control

- **Blower**

Used to blow/remove dust that may have entered inside the computer

- **Dust and Water proof covers** Protect computers from moisture, water and liquids.

When setting up the computer laboratory, consider a location away from excessive dust.

- The room should have special curtains and computers should remain covered using dust covers when not in use.

Antiglare filter screens

- *This is used to avoid eye strain and fatigue caused by over bright CRT monitor*
- *Reduces electromagnetic rays from the CRT monitor*
- Radiation filter screens should be fitted to reduce the light that reaches the eye.

Wool carpet

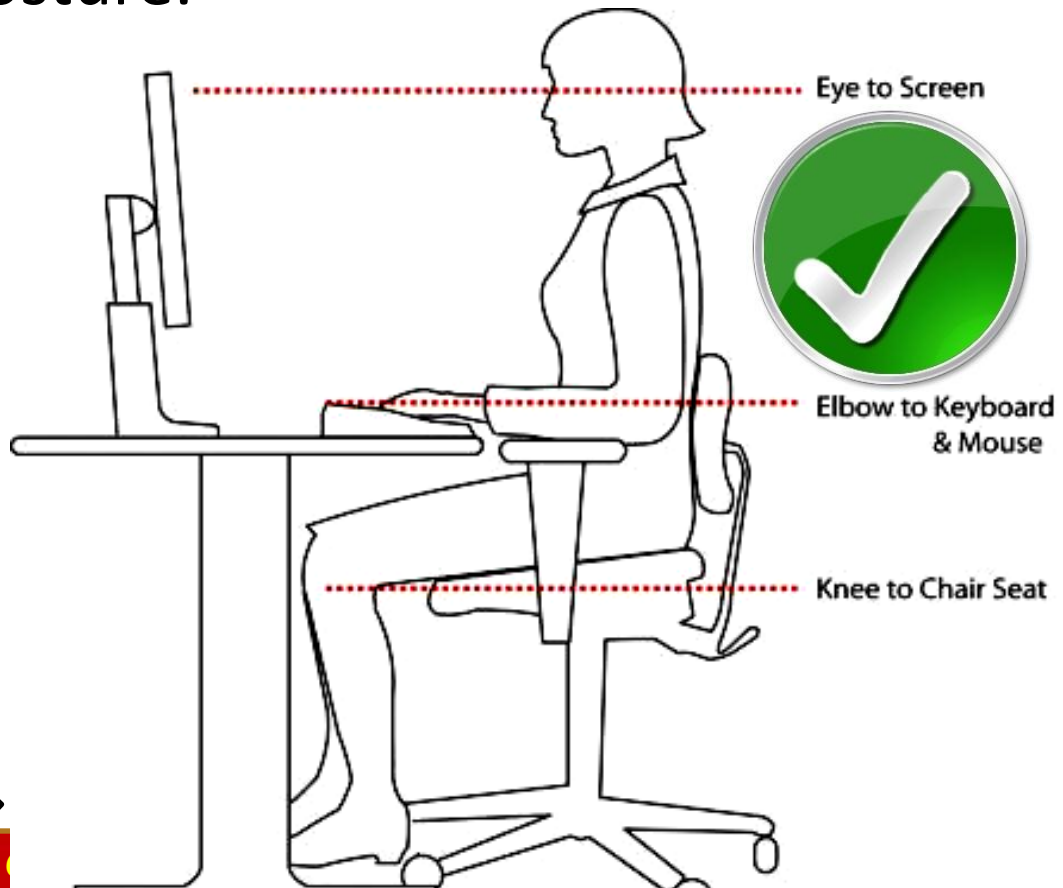
- *Absorb dust*
- *Reduce effects on damage when light objects fall*
- *Minimize effects of electric shocks*
- *Absorb electrical radiations from computer devices*

Software security measures

- Computers should have updated antivirus software installed to prevent malware.
- Remote administration software should be considered with high number of computers in a computer center.
- Computer management software to monitor and limit web browsing should be installed for.
- Group policy or security software to prevent malicious software from being executed and installed.
- Assigning unique authorised log-in for authentication before granting network access.

2.2 Safe use of the computer laboratory.

- A computer room should have enough light avoid eyestrain, and headaches.
- Always Sit upright to avoid muscle pains and back aches caused by poor sitting posture.



2.2 Safe use of the computer laboratory.

Standard furniture: Have standard furniture so that the tables are wide enough and strong to bear the weight of the computers and accommodate all peripherals.

The seat for the user must be comfortable and have a straight backrest that allows someone to sit upright.

2.3 Laboratory rules and regulations.

- **Avoid smoking and exposing computers to dust since they contain small abrasive particles that can damage computer components and cause wearing of moving parts.**
- **Avoid carrying food and beverages to the computer room since these may fall into moving parts causing rusting or electrical faults.**
- **Avoid unnecessary movements because you may accidentally knock down peripheral devices.**
- **At all times follow the right procedures while starting and shutting down the computer therefore abrupt switching on and off the computer should be avoided since this can lead to damaging the computer.**

2.3 Laboratory rules and regulations.

- Do not open up the metallic covers of computers or peripherals without permission and particularly when the computer power is still on.
- Any repairs to the computer should be done by someone who has knowledge regarding computer repairs.
- Any connections (keyboard, mouse, printer and monitor) to the computer should be done when the computer power has been switched off.
- Computers should be regularly serviced and keep a regular record of computer servicing and repair to establish maintenance costs and common problems to your computer.
- Guard your computer against new users who might spoil the computer and data corruption by unauthorized parties

2.3 Laboratory rules and regulations.

- Cover the computers after using them or when not in use. Let the computers cool down before being covered to avoid trapping heat.
- The computers should be cleaned on a regular basis to remove dust from the keyboard, mouse and other parts.
- Keep computers away from excessive dust and fit special curtains that would reduce entry of dust particles and computers should not be exposed to direct sunshine.

2.3 Laboratory rules and regulations.

1. Computer components should be kept dust-free. Avoid smoking and exposing computers to dust.
2. Never try to remove the cover on your computer or touch inside the system unit. There are many sensitive components. Instead, take it to a qualified technician.

2.3 Laboratory rules and regulations.

3. Keep all liquids and food items away from your computer.

- Liquids and food crumbs can cause rusting and corrosion and damage electronic circuits. Also, mixing liquids and electronic components can cause serious electrical shock!

4. Never use your computer during a storm. The computer is connected to electricity and that means that lightning could be conducted to the computer.

2.3 Laboratory rules and regulations.

5. Physically, be careful, avoid knocking and dropping any hardware to the ground as this could cause any of the delicate components to break or be damaged and stop working.
6. Proper shut down of computers should be followed to avoid disk and system failure (avoid abrupt switching off)

2.3 Laboratory rules and regulations.

7. Be careful when using the internet. Do not accept downloads from Internet sites that you don't know and trust.
- And never open an email attachment unless you know and trust the person who sent it.
8. Avoid making hardware connections to the motherboard when the computer is on. Eg keyboard, monitor and mouse connections.

2.3 Laboratory rules and regulations.

9. Don't bring magnetic devices to the lab. The computer has magnetic disks which can be spoilt if they come near other magnetic fields.
10. Handle delicate storage devices with care. Don't touch the inner surface of Compact disks and Floppy disks. Safely remove Flash disks from the system.
11. Avoid excessively bright and flickering computer monitors. The brightness of the computer monitors should be adjusted to avoid eye strain.

Sub Topic 3: Servicing and Maintenance of Computer Systems

Sub topic Objectives:

- Importance of servicing and maintaining a computer
- Cleaning of computers
- installing system and application software.
- uninstalling software.
- Updating of software
- Upgrading software
- Software installation
- Troubleshooting on computers (start-up errors, hanging applications and warm booting).
- Fine-tuning the system

Maintenance of Computers In Good Working Conditions

The following measures should always be carried out to keep computers in good working conditions:

1. Regular servicing should be done for hardware and software updates to ensure proper working conditions of the computers
2. Computers require special cleaning even on the outside including hardware parts such as the mouse and keyboard to perform correctly.

Maintenance of Computers In Good Working Conditions (cont)

3. Always use optimizer utilities that modify programs to make computers to improve performance and make them to run more quickly.
4. Always use and regularly updated antivirus software. Viruses and worms are horrible computer-unfriendly programs that can crash your system and cause damage.

Maintenance of Computers In Good Working Conditions (cont)

5. Avoid Installation Marathons

- Sometimes, installing a new program can cause conflicts within your system.
- It is therefore advisable to use the computer long enough to see how your system responds to the installation before installing the next program.

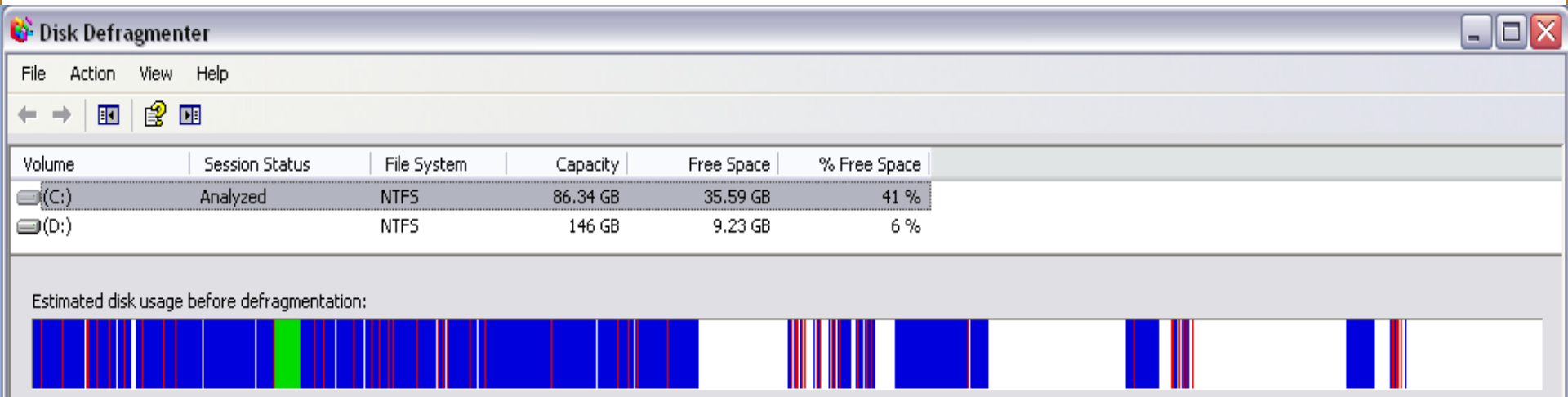
Maintenance of Computers In Good Working Conditions (cont)

7. Carry out Disk Defragmentation when necessary.

- A computer is a storehouse for large amounts of data and so, Having a disorganized computer slows down the processing time.
- Disk Defragmentation organizes files in a way where the computer can easily access everything.

Maintenance of Computers In Good Working Conditions (cont)

- Definition:
- Disk Defragmentation is the process in which scattered pieces of individual files and free space are reorganized and stored in an adjacent manner (next to each other) on the disk.



Study questions

- Define the term computer laboratory
- Mention four factors to consider when preparing a computer laboratory.
- Why must there be safety rules and precautions in a computer laboratory? List any three reasons.
- List down two reasons as to why power cables in the computer laboratory need to be properly insulated.
- Mention two reasons as to why computers need a stable power supply.
- Suggest two ways through which good air circulation can be achieved in a computer laboratory.
- Suggest two reasons why standard furniture must be provided for a computer laboratory.
- Mention five ways through which computers can be kept safe.

Study questions

- Define the following terms

a) Computer literacy (b) Disk Defragmentation

- Suggest any ten rules and regulations that must be followed when in a computer laboratory.
- Your school headmaster wants to setup a new computer laboratory. Explain the requirements needed to setup the laboratory.
- Suggest any five factors to be considered when buying computers.
- Identify any five devices used in computer laboratory maintenance and safety.
- How can physical security be achieved so that access to computers and data centers is regulated?
- Explain any four software security measures that can be enforced in the computer laboratory.

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End of Topic 3: Computer Laboratory Care and Maintenance

Next Topic 4: Computer Word Processing