

# **Operation and Maintenance Manual of Computer Lab**

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## **1. Introduction**

The Post Graduate and Research Department of Computer Science is equipped with hundreds of computers and networked with server . It has three smart class rooms . All the computers are given uninterrupted power supply through UPS. This manual list out the protocols applied in operation and maintenance of all systems. It also list out various checklist used for the operation and maintenance of lab. Most of the client computer problems are attended by in house lab technician. UPS problems are attended by company technician. Students' attendance in the lab are noted in the lab log book and attendance sheet. Lab is secured with CCTV cameras to add security.

## **2.Shape and Size of Computer Labs**

The labs are E-shaped labs

- **Advantages:** Increases the amount of available space for learning and equipment.  
Less mobility to access systems
- **Precaution:** Cables and wires are carefully covered with secure trunking to prevent tripping and breakage Computers are spaced approximately 90 cm apart - this is to ensure that students are not cramped in the classroom Tables are kept at approximately 70 cm high. All Labs have a whiteboard (formica) but NOT a blackboard as chalk dust causes damage to computers

## **3. Tools used in Computer lab**

Using tools properly helps prevent accidents and damage to equipment and people. Protocols for proper use of a variety of hardware, software, and organizational tools specific to working with computers and peripherals are listed here. Also Software tools used to maintain data are also listed.

### **Hardware Tools**

Hardware tools are grouped into four categories:

- ESD tools
- Hand tools

- Cleaning tools
- Diagnostic tools

## ESD Tools

There are two ESD tools: the antistatic wrist strap and the *antistatic mat*. The antistatic wrist strap protects computer equipment when grounded to a computer chassis. The antistatic mat protects computer equipment by preventing static electricity from accumulating on the hardware or on the technician.

## Hand Tools

Some common hand tools and their uses are:

- **Flat-head screwdriver:** Used to tighten or loosen slotted screws.
- **Phillips-head screwdriver:** Used to tighten or loosen cross-headed screws.
- **Torx screwdriver:** Used to tighten or loosen screws that have a star-like depression on the top, a feature that is mainly found on laptops.
- **Hex driver:** Used to tighten or loosen nuts in the same way that a screwdriver tightens or loosens screws (sometimes called a nut driver).
- **Needle-nose pliers:** Used to hold small parts.
- **Wire cutters:** Used to strip and cut wires.
- **Tweezers:** Used to manipulate small parts.
- **Part retriever:** Used to retrieve parts from locations that are too small for your hand to fit.
- **Flashlight:** Used to light up areas that you cannot see well.
- **Wire stripper:** A wire stripper is used to remove the insulation from wire so that it can be twisted to other wires or crimped to connectors to make a cable.
- **Crimper:** Used to attach connectors to wires.
- **Punch-down tool:** Used to terminate wire into termination blocks. Some cable connectors must be connected to cables using a punch down tool.

## Cleaning Tools

Cleaning tools include the following:

- **Soft cloth:** Used to clean different computer components without scratching or leaving debris
- **Compressed air:** Used to blow away dust and debris from different computer parts without touching the components
- **Cable ties:** Used to bundle cables neatly inside and outside of a computer
- **Parts organizer:** Used to hold screws, jumpers, fasteners, and other small parts and prevents them from getting mixed together

## Diagnostic Tools

Diagnostic tools are used to test and diagnose equipment. Diagnostic tools include the following:

- A digital multi meter is a device that can take many types of measurements. It tests the integrity of circuits and the quality of electricity in computer components.
- A loopback adapter, also called a loopback plug, tests the basic functionality of computer ports. The adapter is specific to the port that you want to test.
- The toner probe is a two-part tool. The toner part is connected to a cable at one end using specific adapters, such as an RJ-45, coaxial, or metal clips. The toner generates a tone that travels the length of the cable. The probe part traces the cable. When the probe is in near proximity to the cable to which the toner is attached, the tone can be heard through a speaker in the probe.

## Software Tools

### Disk Management Tools

The following are some disk management tools used in the lab:

- **FDISK:** A command-line tool that creates and deletes partitions on a hard drive. The FDISK tool is not available in Windows XP, Vista, or 7. It has been replaced with the Disk Management tool.
- **Disk Management Tool:** Initializes disks, creates partitions, and formats partitions.
- **Format:** Prepares a hard drive to store information.
- **Scan Disk or CHKDSK:** Checks the integrity of files and folders on a hard drive by scanning the file system. These tools might also check the disk surface for physical errors.
- **Defrag:** Optimizes space on a hard drive to allow faster access to programs and data.
- **Disk Cleanup:** Clears space on a hard drive by searching for files that can be safely deleted.
- **System File Checker (SFC):** A command-line tool that scans the operating system critical files and replaces files that are corrupted.

### Protection Software Tools

Various types of software protect hardware and data:

- **Windows 7 Action Center:** Checks the status of essential security settings. The Action Center continuously checks to make sure that the software firewall and antivirus programs are running. It also ensures that automatic updates download and install automatically.
- **Antivirus program:** Protects against virus attacks.
- **Antispyware program:** Protects against software that sends information about web surfing habits to an attacker. Spyware can be installed without the knowledge or consent of the user.
- **Window 7 Firewall:** Runs continuously to protect against unauthorized communications to and from your computer.

## Organizational Tools

### Reference Tools

The lab technician must document all repairs and computer problems. The documentation can then be used as a reference for future problems or for other technicians who may not have encountered the problem before. The documents are paper based.

It is important that a technician document all services and repairs. These documents need to be stored centrally and made available to all other technicians. The documentation can then be used as reference material for similar problems that are encountered in the future.

### Personal Reference Tools

Personal reference tools include troubleshooting guides, manufacturer manuals, quick reference guides, and repair journals. In addition to an invoice, lab technician keeps a journal of upgrades and repairs. The documentation in the journal includes descriptions of the problem, possible solutions that have been attempted, and the steps taken to repair the problem. Note any configuration changes made to the equipment and any replacement parts used in the repair. This documentation is valuable when you encounter similar situations in the future.

- **Notes:** Notes are taken during troubleshooting and repair process. These notes are referred to avoid repeating previous steps and to determine what steps to take next.
- **Journal:** Document the upgrades and repairs that are performed. Include descriptions of the problem, possible solutions that have been tried to correct the problem, and the steps taken to repair the problem. Note any configuration changes made to the equipment and any replacement parts used in the repair. Your journal, along with your notes, can be valuable when you encounter similar situations in the future.
- **History of repairs:** Make a detailed list of problems and repairs, including the date, replacement parts, and customer information. The history allows a technician to determine what work has been performed on a specific computer in the past.

## **Computer Cleaning Materials**

Computer case and outside of monitor	Mild cleaning solution and lint-free cloth
LCD screen	LCD cleaning solution or distilled water and lint-free cloth
CRT screen	Distilled water and lint-free cloth
Heat sink	Compressed air
RAM	Isopropyl alcohol and lint-free swab
Keyboard	Handheld vacuum cleaner with a brush attachment
Mouse	Glass cleaner and a soft cloth.

## **4. Server Maintenance guidelines used in computer lab**

1. Verify your backups are working.
2. Check disk usage.
3. Monitor RAID Alarms.
4. Update Your OS.
5. Update your Control Panel.
6. Check application updates.
7. Check remote management tools.
8. Check for hardware errors.
9. Check server utilization.
10. Review user accounts.
11. Change passwords.
12. Check system security.

## **UPS & BATTERY MAINTENANCE**

In the department of Computer Science and Applications we have

- 5 UPS (online UPS 20KVA - 4 Nos + 10 KVA – 1 Nos)
- 5 KVA Inverter -1 Nos



- 1 KVA Inverter – 1 Nos
- Batteries – 80 Nos

The following are some of the techniques which we follow in our department to maintain our UPS room

## **UPS MAINTENANCE**

Our UPS preventative maintenance covers a wide variety of tests and inspections including:

- Logs: check operational history and alarm logs.
- UPS room is well away from computer lab for safety reason and monitored over CCTV
- General: inspect and clean the UPS system, batteries and accessories on regular basis.
- Cooling: check fans for operation and ageing.
- Connections: check and adjust all electrical connections (AC and DC).
- Functional: check all functions operate correctly.
- Meters: check all voltages and currents are correct and in specification
- Firmware: check firmware version and upgrade if required.
- Operation: check the transfer from inverter to static bypass and back.
- Mains failure: simulate operation with or without load bank.
- If there is any electrical short circuit we have installed fire extinguishers.
- If there is any other problem occurs with the UPS System. The authorized personnel will rectify the issue.

## **BATTERY MAINTENANCE**

Battery maintenance is well recognized as an important part of running an efficient and safe department. We perform battery maintenance in the correct order to save time, extending the lifespan of our battery and protecting our equipment.

We follow the below correct maintenance order for our batteries:

- Charge battery once it is down to 20% capacity.
- Deliver equalizer charge when necessary. During the process of receiving an equalizer charge, batteries will charge for a longer period of time. This extended charge time may lead to overheating, and batteries should be monitored during this process.
- Turn power off and allow battery to cool before removing.
- If battery is overfilled, clean battery immediately following overflow.
- Clean battery on a regular basis.
- Check battery water levels (wet cell).
- Listen for the “sizzle” discharge from the battery, this is not good.
- Look for corrosion on every connection.
- Inspect for post seal leaks, improper handling or unsupported cables can damage post seals.
- Look for any distortion in the battery cases, indicating possible melting from within.
- Check voltage readings on each cell, typically each cell should be reading 2.5 volts.
- Check total voltage for each string and verify that it is within specifications.
- Wet cells with low voltage readings (2.2 or less) should have their string put on an equalizing charge for 100 hours. After completing the charge verify that the batteries are up to proper voltage.

## **5. Smart Class maintenance**

**Installation:** Computer and Projector are installed with guidelines given by the manufactures.

Smart class are equipped with PC of following configuration

- i. Processor: Intel Core i7-2600, 3.4 GHz, 8MB cache or better
- ii. Chipset: Intel Q67 or higher on OEM motherboard
- iii. Memory: 3GB DDR3 RAM
- iv. HDD: 320 GB @7200 RPM SATA or higher

- v. DVD ROM Drive: 8X
- vi. Windows 8
- vii. Antivirus with one year subscription

### Configuration of LCD Projector

S. No	Description	Minimum Should be
1	Resolution	1024x768
2	Contrast Ratio	8000:1
3	Brightness	3100 ANSI lumens
4	Short Throw Distance	2 feet to 3 feet
5	Image Size / Projection Area	70 inches to 100 inches
6	Compatibility	HDTV Formats (720p, 1080i, 1080p, 575i, 575p), Digital Input (HDMI), Personal Computers, Standard Video, Component Video
7	Aspect Ration	16:10 (WXGA)
8	Interfaces	Mini USB, HDMI Inx1, MONITOR OUTx1, COMPUTER IN X2 Nos., LAN inputx1, Computer Audio- 1Nos., S Video Input With audiox1, Video Input with Audio x1
9	Keystone correction	-+/- 15%
10	Other Features	projection system must be capable of project 90” Image from distance of 25” or in same ratio

## **6. Projector Maintenance**

### **Cleaning the Projection Window**

Clean the projection window periodically, or whenever you notice dust or smudges on the surface.

- To remove dust or smudges, gently wipe the projection window with lens-cleaning paper.
- To remove stubborn smudges, moisten a soft, lint-free cloth with lens cleaner and gently wipe the projection window.

### **Cleaning the Obstacle Sensor**

Clean the projector's obstacle sensor glass (circled in red) periodically, or if you see a message telling you to remove any obstacles that are interfering with the projection area.

- To remove dust or smudges, gently wipe the obstacle sensor glass with lens-cleaning paper.
- To remove stubborn smudges, moisten a soft, lint-free cloth with lens cleaner and gently wipe the obstacle sensor glass.

### **Cleaning the Projector Case**

Before cleaning the projector case, turn off the projector and unplug the power cord.

- To remove dust or dirt, use a soft, dry, lint-free cloth.
  - To remove stubborn dirt, use a soft cloth moistened with water and mild soap.
- Do not spray liquid directly on the projector.

### **Air Filter and Vent Maintenance**

Clean the projector's air filter or vents if they get dusty, or if you see a message telling you to clean them.

- Turn off the projector and unplug the power cord.
- Gently remove the dust using a small vacuum designed for computers or a very soft brush (such as a paintbrush).

### **Projector Lamp Maintenance**

The projector keeps track of the number of hours the lamp is used and displays this information in the projector's menu system.

Replace the lamp as soon as possible when the following occurs:

- The projected image gets darker or starts to deteriorate
- A message appears when you turn on the projector telling you to replace the lamp
- The projector's lamp light is flashing orange

### **Replacing the Remote Control Batteries**

The remote control uses two AA manganese or alkaline batteries. Replace the batteries as soon as they run out.

#### **Caution:**

Use only the type of batteries specified in this manual. Do not install batteries of different types, or mix new and old batteries.

1. Open the battery cover as shown.
2. Remove the old batteries.

**Warning:** If the battery fluid has leaked, wipe it away with a soft cloth and avoid getting the fluid on your hands. If it gets on your hands, wash them immediately to avoid injury.

3. Insert the batteries with the + and – ends facing as shown.
4. Close the battery cover and press it down until it clicks into place.

## Replacing the Pen Batteries

Each pen uses one AA alkaline or Sanyo Eneloop rechargeable battery. Replace the battery as soon as it runs out.

When the battery is low, the pen light flashes as you turn on the switch. When the battery runs out, the pen light goes out.

### **Caution:**

Use only the type of batteries specified in this manual.

1. Open the battery cover as shown.
2. Remove the old battery.

**Warning:** If the battery fluid has leaked, wipe it away with a soft cloth and avoid getting the fluid on your hands. If it gets on your hands, wash them immediately to avoid injury.

3. Insert the battery with the + and – ends facing as shown.
4. Replace the battery cover and press it down until it clicks into place.

## Replacing the Pen Tips

If the pen tips become damaged or no longer work correctly, you can replace them.

1. Twist off the tip of the pen to remove it.
2. Twist on the new tip.

## **7. Power supply precautions**

1. Meter board is kept outside of lab
2. Easily accessible
3. Meter board covered with wooden to avoid water pilferage
4. Necessary precaution sign boards
5. Three phase power supply
6. Well mounted on a wooden board
7. Necessary fire extinguisher placed nearby
8. Electrical circuits be checked by licensed person

## **8. E-Waste management and disposal**

Equipment Disposal The proper disposal or recycling of hazardous computer components is a global issue.

### **Batteries**

Batteries often contain rare earth metals that can be harmful to the environment. Batteries from portable computer systems can contain lead, cadmium, lithium, alkaline manganese, and mercury. These metals do not decay and remain in the environment for many years. Mercury is commonly used in the manufacturing of batteries and is extremely toxic and harmful to humans. Recycling batteries should be a standard practice for a technician. All batteries, including lithium-ion, nickel-cadmium, nickel-metal hydride, and lead-acid, are subject to disposal procedures that comply with local environmental regulations.

### **Monitors**

Monitors contain glass, metal, plastics, lead, barium, and rare earth metals. According to the U.S. Environmental Protection Agency (EPA), monitors can contain approximately 4 pounds (1.8 kg) of lead. Monitors must be disposed of in compliance with environmental regulations. Handle CRT monitors with care. Extremely high voltage can be stored in CRT monitors, even after being disconnected from a power source.

### **Toner Kits, Cartridges**

Developers Used printer toner kits and printer cartridges must be disposed of properly or recycled. Some toner cartridge suppliers and manufacturers take empty cartridges for refilling. Some companies specialize in refilling empty cartridges. Kits to refill inkjet printer cartridges are available but are not recommended, because the ink might leak into the printer, causing irreparable damage. Using refilled inkjet cartridges might also void the inkjet printer warranty.

### **Chemical Solvents and Aerosol Cans**

Never dump chemicals or solvents down a sink or dispose of them in a drain that connects to public sewers. The cans or bottles that contain solvents and other cleaning supplies must be handled carefully. Make sure that they are identified and treated as special hazardous waste. For example, some aerosol cans explode when exposed to heat if the contents are not completely used.

## **9. Security & Safety For Computers Labs**

- A solid steel or grilled door with a strong lock
- Grilled windows (with the bars firmly attached to the wall)
- Solid walls with no gaps or holes
- Sealed and secured roof/ceiling .
- Cemented floors.
- Windows that can be opened. Window shades are placed over the windows to prevent dust and rain from entering the room; this will also allow light to pass through.
- No smoking, food, or drink are permitted in computer labs, as they can damage the equipment and attract insects or rodents.
- Supply garbage bins, and keep workspaces clean and clear of sharp objects and debris.
- Secure monitors, keyboards, mice and audio hubs to prevent removal and theft.



## **10. Laboratory General Inspection Checklist**

### **General Safety & Environmental Conditions**

1. Are the lab rules posted on the outside of the door?
2. Is the lighting in the laboratory adequate and in good condition?
3. Is the temperature in the laboratory well controlled?
4. Are items such as lab equipment and glass tubing stored in a manner so that they do not project beyond the edge of the counter or shelf?
5. Are the food and beverage rules observed? (Such as food and drinks are not stored in the lab area).
6. Are the ceiling tiles in place and free of any water leaks, or stains, etc.?
7. Is the garbage free of broken glass or hazardous materials? Are broken glass boxes being utilized?
8. Are doors closed, not propped, and free from obstruction?
9. Are bench tops and storage areas uncluttered and orderly?
10. Are aisles and exits free from obstruction?
11. Are Exit signs illuminated and unobstructed?
12. Are heavy objects stored on lower shelves?
13. Are there means available to reach items above shoulder level safely, such as a step stool?
14. Is there an 18" clearance from sprinkler heads? Is there a 24" clearance when there are no sprinkler heads?
15. Are the interiors of refrigerators and freezers sound and free of chemical spills or contamination and with containers tightly closed?

16. Are refrigerators and freezers labeled? “Flammables”, “explosion proof” or “Not for Food Storage”?
17. Are microwaves labeled “Not for food preparation”?
18. Is the glassware free from cracks, chips and other defects?
19. Are vacuum pump belt guards in place (if applicable)?

### **Personal Protective Equipment**

1. Are the personnel and students wearing appropriate footwear? (no open toe shoes)
2. Are protective gloves available and matched to the hazard?
3. Is eye protection available and used?
4. Is there signage posted if eye protection is required?
5. Are long pants and lab coats being worn?
6. Is PPE being removed before leaving the laboratory?
7. Is there any loud equipment that should be tested for hearing protection requirements or that already requires hearing protection?
8. Are there any hazards that warrant the use of respiratory protection? If so, what type is used?
9. Is there signage posted where respiratory protection is required?

### **Fume Hoods**

1. Are fume hoods clean and free of stored chemicals?
2. Are fume hoods in good condition & inspected within the past year?
3. Is the sash opening 18” or lower on the fume hood?

## **Safety Equipment and Emergency Response**

1. Are EHS emergency contact cards displayed near phones or in a conspicuous location?
2. Are there at least two laboratory contacts with phone numbers on the EHS emergency contact card?
3. Are safety showers and eye wash facilities accessible and free from obstruction?
4. Are eyewashes in good condition, clean and capped?
5. Are first aid kits in designated areas? Are they properly stocked with the supply list inside, without expired products?
6. Are fire extinguishers clearly identified, accessible and free from obstruction?
7. Are extinguishers fully charged and inspected annually?
8. Are emergency switches clearly identified for power and gas supply and easily accessible?
9. Are lab personnel aware of emergency procedures in their area?
10. Are lab personnel aware of chemical/biological spill procedures?
11. Are there spill cleanup kits or supplies available in the lab area?
12. Do personnel know the location of emergency equipment in the area?
13. Are all fire alarm pull stations unobstructed?
14. Are fire evacuation maps posted and unobstructed (with two means of egress)?
15. Are personnel familiar with the evacuation plan and muster points?
16. Do all lab personnel question all visitors or suspicious persons when they enter the lab?

## **Electrical Safety**

1. Are extension cords or “Daisy Chains” being used as permanent wiring for appliances in the lab area?
2. Is the wiring on laboratory equipment in good condition (no frayed or exposed wires) and secure along the wall or benches?
3. Are electrical cords and appliances away from flammables and water (sinks)?
4. Are outlets near sinks GFCI?
5. Are all electrical outlet and switch plates in place?
6. Are red outlets being used for critical equipment that requires continuous power?
7. Is the circuit breaker box unobstructed and clear by at least 36 inches? Is it signed to keep clear?

## **Chemical Safety**

1. Is the chemical hygiene plan readily accessible either on a computer or a hard copy?
2. Do the lab personnel know who the Chemical Hygiene Officer is for their area?
3. Are all chemical labels intact and not defaced?
4. Are signs on storage areas and laboratories consistent with hazards within?
5. Is there an updated inventory of the chemicals in the laboratory?
6. Are the Safety Data Sheets available for all chemicals present in the laboratory?
7. Do the lab personnel know where to find the SDS's for the lab chemicals? (Central storage area?)
8. Are all chemical containers well labeled, capped and in good condition?
9. Are personnel and students familiar with spill cleanup requirements of their chemicals?

10. Are spill cleanup supplies easily accessible?
11. Is there restricted access to controlled substances?
12. Is there a method for logging access to controlled substances and has it been utilized?

### **Hazardous Materials Storage**

1. Are all chemicals stored correctly, segregated by hazard and according to compatibility (e.g., organic from oxidizers, flammable from acids)?
2. Are flammables stored in marked "Flammable" cabinets?
3. Are Acids stored in marked "Acid" cabinets?
4. Are corrosive & flammable chemicals stored below "eye level"?
5. Are chemicals kept away from desks?
6. Are highly flammable liquids stored away from sources of heat and ignition (including Bunsen burners in fume hoods)?
7. Are all containers of non-hazardous materials used/stored limited to small quantities?
8. Do chemical containers have a second containment, particularly containers > 20L?
9. Are all glass containers stored so they are not on the floor?

### **Compressed Gas Cylinders**

1. Are gas cylinders properly chained/secured and in use?
2. Are cylinder caps in place when cylinders are not in use or being moved?
3. Are cylinders transported on a cart with chains?
4. Are cylinders properly labeled?
5. Are full and empty cylinders stored separately?
6. Are regulators, proper connections and tubing in good condition?

## **Training**

1. Have all personnel and students had lab safety training/orientation?
2. Have all personnel and students been trained on the emergency plan for the lab?
3. Have all personnel taken the required EHS Blackboard training?

## **Waste Accumulation Area**

1. Is there a Waste Accumulation Area in the lab?
2. Are the containers labeled with the words “Hazardous Waste”?
3. Is each container labeled with the start date and full date for each?
4. Are all waste containers intact and free of cracks and compatible with their contents?

## **11. Laboratory Inspection Checklist**

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2. Are protective gloves available and matched to the hazard?
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