

Safe Operation Procedure (SOP)

Electronics and Microprocessor Laboratories, Department of EEE, BUET

1. Purpose

This Standard Operating Procedure (SOP) defines safe working practices for students, teachers, and staff in the **Electronics Laboratory, Power Electronics Laboratory, Digital Electronics Laboratory, Microprocessor and Embedded System Laboratory, Biomedical Instrumentation Laboratory** and **Optoelectronics Laboratory**. The objective is to minimize risks associated with **electric shock, short circuits, component damage, electrostatic discharge (ESD), overheating, and equipment malfunction**, and to ensure safe and reliable operation of laboratory instruments and electronic circuits.

2. Scope

This SOP applies to all laboratory activities involving:

- Low-voltage DC and AC power supplies
- Breadboards and prototyping boards
- Discrete electronic components and ICs
- Function generators and oscilloscopes
- Probes, test leads, and hand tools
- Student-built and instructor-provided electronic circuits

This SOP is mandatory for all users of the Low Voltage & Electronics Laboratory.

3. Responsibilities

3.1 Laboratory In-Charge / Faculty

- Ensure laboratory equipment is safe, functional, and properly rated.
- Provide safety briefing before each lab session.
- Verify circuit designs and power ratings before students apply power.
- Supervise correct use of power supplies, probes, and IC handling.

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3.2 Laboratory Instructor / Teaching Assistant / Staff

- Verify circuit designs and power ratings before students apply power.
- Stop any unsafe practice immediately.
- Maintain records of damaged equipment and repairs.
- Ensure availability of ESD protection and insulated tools.

3.3 Students / Users

- Follow all SOP instructions strictly.
 - Do not operate equipment without authorization.
 - Report hazards, damaged equipment, or unsafe conditions promptly.
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4. General Laboratory Safety Requirements

- Eating, drinking, and liquids are prohibited near electronic circuits.
 - Metallic personal items (rings, watches, chains) should be removed before working on circuits.
 - Workbenches must be kept clean and free of loose wires and metal fragments.
 - Proper seating posture and clear workspace must be maintained to avoid accidental contact with live conductors.
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5. Electrical Safety Procedures

1. Set Current Limits on Power Supplies

Always set appropriate current limits on DC power supplies before energizing circuits to protect components and prevent damage in case of accidental short circuits.

2. Use ESD Wrist Straps and Grounding

Wear Electrostatic Discharge (ESD) straps (shown in Figure 1) to safely drain static electricity from human body to prevent permanent damage to sensitive electronic components. As per IEC 61340-5-1 standard, ESD straps are required in electronics laboratories. Electrostatic Discharge Stand shown in figure 2 can be an alternative to ESD straps.

3. Handle ICs Properly

Hold ICs by the edges. Do not touch pins unnecessarily. Store ICs in anti-static foam or bags when not in use.

4. Avoid Unintentional Contact Between Wires and Leads

Ensure wires and component leads do not touch unintentionally. Keep wiring neat and properly routed to prevent short circuits.

5. Keep Power OFF During Circuit Assembly and Modification

Power supplies must remain OFF while building, modifying, or troubleshooting circuits. Never insert or remove components when power is ON.

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6. **Do Not Touch Exposed Conductors**

Do not touch live wires, exposed conductors, or energized terminals with bare hands. Always use insulated probes and tools.

7. **Use Correct Voltage and Current Ratings**

Verify that applied supply voltage and current limits do not exceed the ratings of components, ICs, probes, and breadboards.



Figure 1: ESD straps should be used to prevent permanent damage to sensitive electronic components



Figure 2: Electrostatic Discharge Stand for human body static discharge, an alternative to ESD straps

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6. Equipment Safety Procedures

1. Correct Use of Instruments

Use oscilloscopes, function generators, and multimeters within their rated limits. Do not exceed maximum input ratings of probes and measurement instruments.

2. Proper Shutdown After Use

Switch OFF power supplies, function generators, and oscilloscopes when not in use to prevent overheating, energy waste, and equipment damage.

3. Inspect Equipment Before Use

Do not use damaged power supplies, probes, cables, or breadboards. Report faulty equipment immediately to the lab instructor or technician.

4. Check Wiring and Component Orientation

Always verify wiring connections, component orientation (diodes, ICs, electrolytic capacitors), and loose wires before applying power. Check polarity of electrolyte capacitors before applying power

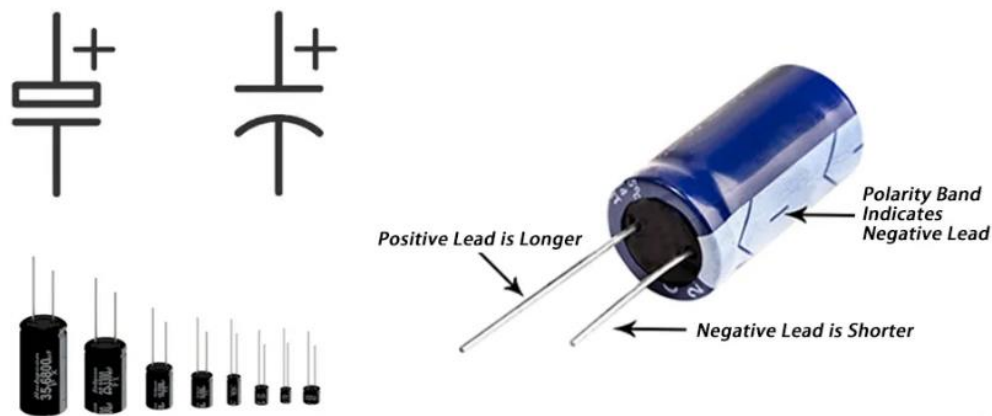


Figure 3: Polarity checking of electrolytic capacitors is mandatory before applying power.

7. Standard Operating Workflow

Before Experiment

- Set current limits on power supplies.
- Check wiring, polarity, and component orientation.
- Ensure ESD protection is in place.
- Clear bench of metal objects and liquids.

During Experiment

- Do not touch exposed conductors.
- Monitor power supply current and component heating.

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- Use insulated probes only.

After Experiment

- Switch OFF all power supplies and instruments.
 - Remove components carefully.
 - Clean the workspace and return tools to proper locations.
 - Report any damaged equipment.
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8. Emergency and Incident Procedures

- **Short Circuit / Smoke / Overheating:** Immediately switch OFF power supplies and inform the instructor.
 - **Equipment Damage:** Isolate the equipment and report to the lab in-charge.
 - **Spillage on Equipment:** Switch OFF power and notify staff immediately.
 - **Incident report guidelines:** If any equipment gets damaged while using it, make an incident report and submit to the lab in-charge
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9. Training and Compliance

- All users must attend laboratory safety orientation before performing experiments.
- Repeated violation of SOP may result in suspension of lab access.
- This SOP shall be reviewed annually and updated as equipment or safety requirements change.

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