



M.S. Ramaiah College of Arts, Science and Commerce

DBT-STAR College Programme

Department of Electronics

STANDARD OPERATING PROCEDURE (SOP)

SOP No.: MSRCASC/DBT/ELEC/SOP-01

Title: General Safety and Conduct in the Electronics Laboratory

1. Objective

To establish standardized safety and operating practices as well as awareness for undergraduate electronics laboratory activities.

2. Scope

Applicable to faculty, laboratory staff and students using electronics laboratories for teaching, practicals, projects and demonstrations.

3. Principle

Electronics laboratories contain energized circuits, power supplies, test instruments, soldering equipment and electronic components. Standardized procedures reduce electrical, thermal, fire and equipment-related hazards and improve reproducibility of practical work.

4. Responsibilities

- Faculty/Faculty In-charge: Ensure safety instructions are explained and practical work is supervised.
- Laboratory Staff/Technical Assistant: Maintain equipment, workstations, inventories and safety records; report faults.
- Students: Follow instructions, use equipment responsibly, maintain cleanliness and report accidents or malfunction immediately.

5. Materials and Components

- Electronic components and connecting wires
- Breadboards and trainer kits
- Labels and markers

6. Equipment Required

- DC power supply
- Digital multimeter
- Oscilloscope/CRO
- Function generator
- Soldering station where applicable

7. Procedure

- Enter the laboratory only with permission and follow the assigned workstation.
- Read the experiment and circuit diagram before beginning.
- The water bottles are not allowed inside lab.
- Keep bags and personal belongings in the racks provided inside the lab.
- Switch OFF power before making or changing circuit connections.
- Get the circuit checked by the faculty before energizing it.
- Operate instruments only within their rated voltage, current and input limits.
- Keep the workbench organized and free of unnecessary wires and components.
- Switch OFF and disconnect all equipment after completing the experiment.
- Return components and instruments to their designated locations and clean the workstation.

8. Quality Control

- Verify equipment is physically intact before use.
- Use calibrated/verified measuring instruments where applicable.
- Check that connecting leads and plugs are undamaged.
- Record equipment faults or deviations.

9. Safety Precautions

- Never work with wet hands.
- Do not touch exposed energized conductors unnecessarily.
- Do not overload sockets or extension boards.
- Do not use damaged power cords or instruments.
- Know the location of the main power switch/emergency cutoff.
- Do not attempt unauthorized repairs.
- Report smoke, sparks, unusual heating, electric shock or fire immediately.

10. Waste Disposal

- Segregate damaged electronic components, wires and batteries according to institutional e-waste procedures.
- Do not dispose of electronic waste with general waste where separate collection is provided.
- Broken glass and sharp component leads shall be handled safely and disposed of in designated containers.

11. Expected Outcome

Students should be able to conduct electronics practicals safely, systematically and responsibly.

12. Troubleshooting

Observation/Problem	Possible Cause	Corrective Action
Circuit does not operate	Power supply OFF or incorrect connection	Switch OFF, recheck circuit and obtain faculty verification
Component overheating	Excess current, wrong polarity or short circuit	Switch OFF immediately; identify and correct the cause
Instrument gives abnormal reading	Wrong range, probe connection or faulty lead	Check settings and connections; use a verified lead/instrument

13. Records and Documentation

- Laboratory attendance/usage register
- Equipment usage and fault register
- Experiment/practical record
- Incident/accident record where applicable
- E-waste/disposal record where applicable

14. References

- Department of Electronics, MSRCASC – Approved Laboratory Manual.
- MSRCASC Institutional Laboratory Safety Manual.
- Manufacturer's operation and maintenance manual for the relevant equipment.
- Institutional procedures for electrical/electronic equipment safety and e-waste management.

15. Document Control

Prepared by: _____

Designation: _____

Reviewed by: _____

Designation: _____



Approved by: _____

Designation: _____

Signature: _____

Date: _____

Next Review: _____

16. Student Learning Outcomes

- Students should understand the purpose and correct operation of the equipment or procedure covered by this SOP.
- Students should follow safe laboratory practices and perform the practical systematically.
- Students should record observations, calculations and results accurately.
- Students should identify common faults and report equipment abnormalities appropriately.

SOP No.: MSRCASC/DBT/ELEC/SOP-02

Title: Safe Operation of DC Regulated Power Supply

1. Objective

To establish a standardized procedure for safe selection, connection and operation of a regulated DC power supply during electronics practicals.

2. Scope

Applicable to students and staff using laboratory DC power supplies for analog, digital, communication and embedded electronics experiments.

3. Principle

A regulated power supply provides a controlled DC voltage/current to an electronic circuit. Correct polarity, suitable limits and gradual energization help prevent component and instrument damage.

4. Responsibilities

- Faculty: Demonstrate correct operation and verify student circuits.
- Laboratory Staff: Maintain power supplies and check leads, protection and calibration status.
- Students: Set appropriate limits, verify connections and operate under supervision.

5. Materials and Components

- Circuit under test
- Connecting leads
- Required electronic components

6. Equipment Required

- Regulated DC power supply
- Digital multimeter for verification
- Appropriate power leads

7. Procedure

- Inspect the power supply, display and output leads for damage.
- Ensure the output is OFF before connecting the circuit.
- Set the required voltage and an appropriate current limit according to the experiment.
- Verify polarity and connect the circuit correctly.
- Obtain faculty verification where required.

- Switch ON the output and observe voltage/current readings.
- Monitor the circuit as well as plugs for abnormal heating, sound or smell.
- Switch OFF the output before changing any circuit connection.
- After completion, return voltage/current settings to a safe minimum and switch the unit OFF.

8. Quality Control

- Check displayed voltage before connecting the load.
- Verify output polarity.
- Use current limiting where available.
- Record abnormal behavior and equipment faults.

9. Safety Precautions

- Never short the output terminals.
- Do not exceed component voltage/current ratings.
- Do not change wiring while output is energized.
- Switch OFF while disconnecting or troubleshooting the circuit.

10. Waste Disposal

- Faulty power supplies shall be tagged and reported rather than discarded or repaired by students.
- Damaged leads and electronic parts shall follow institutional e-waste procedures.

11. Expected Outcome

Students should be able to safely set, connect, operate and shut down a regulated DC power supply.

12. Troubleshooting

Observation/Problem	Possible Cause	Corrective Action
No output	Output disabled or protection activated	Switch OFF, inspect load and settings, then restart safely
Voltage collapses under load	Excessive current demand or short circuit	Switch OFF and check the circuit
Component becomes hot	Incorrect voltage/polarity or excessive current	Switch OFF immediately and verify ratings and connections

13. Records and Documentation

- Power supply usage register
- Equipment fault/maintenance record
- Experiment observations and readings

14. References

- Department of Electronics, MSRCASC – Approved Laboratory Manual.
- Manufacturer’s operation and maintenance manual for the relevant equipment.
- Institutional procedures for electrical/electronic equipment safety and e-waste management.

15. Document Control

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16. Student Learning Outcomes

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- Students should record observations, calculations and results accurately.
- Students should identify common faults and report equipment abnormalities appropriately.

SOP No.: MSRCASC/DBT/ELEC/SOP-03

Title: Operation and Use of Digital Multimeter

1. Objective

To standardize the measurement of voltage, current, resistance and continuity using a digital multimeter.

2. Scope

Applicable to routine undergraduate electronics practicals involving DC/AC electrical measurements and component testing.

3. Principle

A digital multimeter measures electrical quantities using selectable functions and ranges. Correct terminal selection and measurement mode are essential for safe and accurate measurements.

4. Responsibilities

- Faculty: Demonstrate measurement modes and safety precautions.
- Students: Select the correct function, range and terminals and record readings accurately.

5. Materials and Components

- Circuit/component under test
- Test leads/probes
- Electronic components as required

6. Equipment Required

- Digital multimeter
- Appropriate test probes

7. Procedure

- Inspect the meter and probes for damage.
- Select the required measurement function and range.
- For voltage, connect the meter in parallel with the circuit element.
- For current, connect the meter in series and use the correct current terminal.
- For resistance/continuity, ensure the circuit is de-energized.
- Place probes correctly and take the reading.
- Record the value with its unit and range.

- After use, return the meter to a safe setting and store it properly.

8. Quality Control

- Use a known reference or approved check point where applicable.
- Ensure correct range and polarity.
- Repeat unusual readings after checking connections.
- Record units and significant observations.

9. Safety Precautions

- Never measure resistance on an energized circuit.
- Never connect a meter configured for current directly across a voltage source.
- Use only the rated input category/range of the meter.
- Do not touch bare probe tips unnecessarily.

10. Waste Disposal

- Damaged probes, meters or electronic components shall be segregated and reported for authorized repair or e-waste handling.

11. Expected Outcome

Students should be able to select appropriate multimeter modes and obtain safe, reliable measurements.

12. Troubleshooting

Observation/Problem	Possible Cause	Corrective Action
Display shows overload	Range too low or incorrect function	Select an appropriate higher range/function
Zero/unstable reading	Poor contact or discharged meter battery	Check probes, terminals and meter condition
Fuse repeatedly fails	Incorrect current measurement connection	Switch OFF and review the circuit and terminal selection

13. Records and Documentation

- Multimeter usage register
- Calibration/verification record where applicable
- Measurement/experiment record
- Fault report

14. References

- Department of Electronics, MSRCASC – Approved Laboratory Manual.

- Manufacturer's operation and maintenance manual for the relevant equipment.
- Institutional procedures for electrical/electronic equipment safety and e-waste management.

15. Document Control

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16. Student Learning Outcomes

- Students should understand the purpose and correct operation of the equipment or procedure covered by this SOP.
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- Students should record observations, calculations and results accurately.
- Students should identify common faults and report equipment abnormalities appropriately.

SOP No.: MSRCASC/DBT/ELEC/SOP-04

Title: Safe Operation and Use of CRO/Oscilloscope

1. Objective

To establish a standardized procedure for observing and measuring electrical waveforms using a CRO/oscilloscope.

2. Scope

Applicable to undergraduate practicals involving waveform measurement, frequency, amplitude, phase and transient analysis.

3. Principle

An oscilloscope displays voltage as a function of time. Correct probe connection, attenuation, grounding and vertical/horizontal settings are required for reliable measurements.

4. Responsibilities

- Faculty: Demonstrate safe probe connection, triggering and measurement.
- Laboratory Staff: Maintain probes and instrument condition.
- Students: Use appropriate probe settings and stay within instrument input limits.

5. Materials and Components

- Circuit under test
- Oscilloscope probe(s)
- Signal source where required

6. Equipment Required

- CRO/Digital storage oscilloscope
- Function generator
- BNC/probe accessories

7. Procedure

- Inspect the oscilloscope, probe and cables.
- Switch on the oscilloscope and allow it to initialize.
- Select the appropriate coupling, volts/div and time/div settings.
- Connect the probe correctly and ensure the probe attenuation setting matches the instrument.
- Connect the probe ground/reference only where appropriate for the instrument and circuit.

- Apply the test signal and adjust triggering for a stable waveform.
- Measure amplitude, time period, frequency or phase as required.
- Record waveform observations and numerical readings.
- Remove the probe safely and switch off the equipment after use.

8. Quality Control

- Check probe compensation where applicable.
- Verify displayed scale and units.
- Repeat measurements if the waveform is unstable or clipped.
- Use appropriate controls for the expected signal range.

9. Safety Precautions

- Do not exceed the oscilloscope/probe input rating.
- Avoid unsafe grounding arrangements.
- Do not connect a grounded oscilloscope clip to a point that may be at hazardous potential.
- Switch off or isolate the circuit before changing connections when required.

10. Waste Disposal

- Damaged probes/cables shall be reported and removed from service until checked.
- Electronic accessories shall follow institutional e-waste procedures when beyond repair.

11. Expected Outcome

Students should be able to safely observe, measure and interpret basic electronic waveforms.

12. Troubleshooting

Observation/Problem	Possible Cause	Corrective Action
No waveform	Incorrect connection or trigger setting	Check probe, source and trigger settings
Waveform clipped	Input amplitude exceeds selected range	Increase volts/div or reduce source amplitude
Noisy waveform	Poor grounding or external interference	Check probe connection, grounding and wiring

13. Records and Documentation

- Oscilloscope usage record
- Equipment fault/maintenance record
- Waveform/measurement record

14. References

- Department of Electronics, MSRCASC – Approved Laboratory Manual.
- Manufacturer’s operation and maintenance manual for the relevant equipment.
- Institutional procedures for electrical/electronic equipment safety and e-waste management.

15. Document Control

Prepared by: _____

Designation: _____

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Designation: _____

Approved by: _____

Designation: _____

Signature: _____

Date: _____

Next Review: _____

16. Student Learning Outcomes

- Students should understand the purpose and correct operation of the equipment or procedure covered by this SOP.
- Students should follow safe laboratory practices and perform the practical systematically.
- Students should record observations, calculations and results accurately.
- Students should identify common faults and report equipment abnormalities appropriately.

SOP No.: MSRCASC/DBT/ELEC/SOP-05

Title: Standardized Operation of Function Generator

1. Objective

To establish a standardized procedure for generating and applying sinusoidal, square, triangular and other permitted test signals.

2. Scope

Applicable to undergraduate electronics and communication laboratory experiments.

3. Principle

A function generator provides controlled test signals of selected waveform, frequency, amplitude and offset. Incorrect settings can damage the circuit under test.

4. Responsibilities

- Faculty: Demonstrate waveform, amplitude, frequency and offset settings.
- Laboratory Staff: Maintain generator, cables and output connectors.
- Students: Confirm settings before connection and remain within circuit limits.

5. Materials and Components

- Circuit under test
- BNC/test leads
- Oscilloscope where required

6. Equipment Required

- Function generator
- Oscilloscope/DMM for verification

7. Procedure

- Inspect the generator and output cable.
- Select the required waveform.
- Set frequency, amplitude and DC offset as specified by the experiment.
- Keep output disabled or amplitude at a safe minimum while connecting where the equipment permits.
- Connect the output to the circuit and verify the waveform.
- Gradually adjust amplitude/frequency to the required values.

- Record the settings and observations.
- Return output to a safe state and disconnect after the experiment.

8. Quality Control

- Verify amplitude and frequency using an oscilloscope where required.
- Check DC offset before connecting sensitive circuits.
- Record generator settings in the experiment record.

9. Safety Precautions

- Do not exceed the input rating of the circuit or connected instrument.
- Avoid accidental DC offset.
- Do not short the generator output unless the equipment is specifically designed to tolerate it.

10. Waste Disposal

- Damaged cables and connectors shall be removed from use and reported for repair or replacement.
- Unserviceable electronic equipment shall follow institutional e-waste procedures.

11. Expected Outcome

Students should be able to configure and use a function generator safely for standard electronics experiments.

12. Troubleshooting

Observation/Problem	Possible Cause	Corrective Action
Incorrect frequency	Wrong unit/range selected	Verify Hz/kHz/MHz setting and displayed value
Unexpected DC level	Offset enabled	Set offset to the required value, often zero
Distorted output	Amplitude too high or load issue	Reduce amplitude and check load/connection

13. Records and Documentation

- Function generator usage register
- Equipment fault record
- Experiment settings and observations

14. References

- Department of Electronics, MSRCASC – Approved Laboratory Manual.
- Manufacturer's operation and maintenance manual for the relevant equipment.

- Institutional procedures for electrical/electronic equipment safety and e-waste management.

15. Document Control

Prepared by: _____

Designation: _____

Reviewed by: _____

Designation: _____

Approved by: _____

Designation: _____

Signature: _____

Date: _____

Next Review: _____

16. Student Learning Outcomes

- Students should understand the purpose and correct operation of the equipment or procedure covered by this SOP.
- Students should follow safe laboratory practices and perform the practical systematically.
- Students should record observations, calculations and results accurately.
- Students should identify common faults and report equipment abnormalities appropriately.

SOP No.: MSRCASC/DBT/ELEC/SOP-06

Title: Breadboard Assembly and Circuit Testing

1. Objective

To standardize circuit assembly, inspection and testing using solderless breadboards.

2. Scope

Applicable to undergraduate analog, digital, communication, microcontroller and basic electronics experiments.

3. Principle

A breadboard provides temporary electrical interconnections. Correct node identification, power-rail awareness and systematic testing are essential for reliable circuit operation.

4. Responsibilities

- Faculty: Demonstrate breadboard internal connections and safe testing.
- Laboratory Staff: Maintain breadboards and component kits.
- Students: Assemble circuits according to diagrams and avoid energized rewiring.

5. Materials and Components

- Breadboard
- ICs and electronic components
- Jumper wires
- Circuit diagram

6. Equipment Required

- DC regulated power supply
- Digital multimeter
- Oscilloscope/function generator as required

7. Procedure

- Inspect the breadboard and identify power rails and terminal strips.
- Switch OFF the power supply.
- Place components according to the circuit diagram and pin configuration.
- Use short, clearly routed jumper wires.
- Verify IC orientation, polarity-sensitive components and power connections.

- Check continuity and possible shorts before energizing.
- Get the circuit verified where required.
- Power the circuit and take measurements systematically.
- Switch OFF power before modifying the circuit.
- Disassemble and return components after completion.

8. Quality Control

- Verify circuit against the schematic before power-on.
- Check supply rails and ground continuity.
- Use component values within specified tolerances.
- Record measured values.

9. Safety Precautions

- Never insert/remove ICs while powered unless the equipment is specifically designed for it.
- Avoid shorting power rails.
- Observe correct polarity of diodes, electrolytic capacitors and ICs.
- Do not force components into sockets.

10. Waste Disposal

- Broken breadboards, wires and components shall be separated and reported.
- Electronic waste shall be handled according to institutional procedures.

11. Expected Outcome

Students should be able to assemble, inspect, test and dismantle breadboard circuits safely.

12. Troubleshooting

Observation/Problem	Possible Cause	Corrective Action
Circuit not working	Wrong node connection or component orientation	Switch OFF and trace the circuit against the schematic
IC overheating	Incorrect supply/pin connection or short	Switch OFF immediately and verify pinout and supply
Intermittent operation	Loose jumper/component contact	Inspect and replace defective connections

13. Records and Documentation

- Breadboard issue/fault register
- Component inventory record
- Experiment circuit and observation record

14. References

- Department of Electronics, MSRCASC – Approved Laboratory Manual.
- MSRCASC Institutional Laboratory Safety Manual.
- Manufacturer’s operation and maintenance manual for the relevant equipment.
- Institutional procedures for electrical/electronic equipment safety and e-waste management.

15. Document Control

Prepared by: _____

Designation: _____

Reviewed by: _____

Designation: _____

Approved by: _____

Designation: _____

Signature: _____

Date: _____

Next Review: _____

16. Student Learning Outcomes

- Students should understand the purpose and correct operation of the equipment or procedure covered by this SOP.
- Students should follow safe laboratory practices and perform the practical systematically.
- Students should record observations, calculations and results accurately.
- Students should identify common faults and report equipment abnormalities appropriately.

SOP No.: MSRCASC/DBT/ELEC/SOP-07

Title: Safe Soldering and Desoldering Procedure

1. Objective

To establish safe and systematic practices for soldering and desoldering electronic components and wires.

2. Scope

Applicable to supervised undergraduate laboratory work, PCB assembly, repair demonstrations and project activities.

3. Principle

Soldering joins conductive surfaces using a heated soldering tool. The main hazards are burns, hot surfaces, fumes and accidental damage to components or PCB tracks.

4. Responsibilities

- Faculty: Demonstrate soldering technique and safety.
- Laboratory Staff: Maintain soldering stations, stands, ventilation and accessories.
- Students: Use soldering equipment only at designated stations and follow safety instructions.

5. Materials and Components

- Soldering wire as approved
- PCB/prototype board
- Components
- Flux where approved
- Desoldering braid/pump where required

6. Equipment Required

- Temperature-controlled soldering station
- Soldering stand
- Fume extraction/adequate ventilation
- Heat-resistant accessories where required

7. Procedure

- Inspect the soldering iron, cable and stand.

- Place the iron securely in its stand and switch it on only when ready to work.
- Prepare clean component leads, pads and wires.
- Heat the joint appropriately and apply the required amount of solder.
- Remove the solder source and allow the joint to cool.
- Inspect the joint for continuity, bridging and mechanical integrity.
- For desoldering, use the approved desoldering tool without excessive heating.
- Switch OFF and unplug the soldering station after use and allow it to cool safely.

8. Quality Control

- Inspect solder joints visually.
- Check continuity where required.
- Avoid excessive solder and bridging.
- Confirm component orientation before final soldering.

9. Safety Precautions

- Never touch the iron tip or recently soldered joints.
- Always keep the iron in its stand.
- Maintain ventilation and avoid direct inhalation of fumes.
- Keep flammable materials away.
- Do not leave a powered soldering iron unattended.
- Do not solder on energized circuits.

10. Waste Disposal

- Collect soldering waste and damaged electronic components appropriately.
- Do not dispose of electronic components with ordinary waste when e-waste collection is available.

11. Expected Outcome

Students should be able to perform basic soldering and desoldering while maintaining personal and equipment safety.

12. Troubleshooting

Observation/Problem	Possible Cause	Corrective Action
Poor/rough joint	Insufficient heating or contaminated surface	Clean joint and repeat using correct technique
Solder bridge	Excess solder	Remove excess solder and inspect adjacent tracks
PCB pad damaged	Excessive heating or mechanical force	Stop work and report the PCB for assessment

13. Records and Documentation

- Soldering station usage record
- Project/PCB work record
- Fault/damage record
- E-waste record where applicable

14. References

- Department of Electronics, MSRCASC – Approved Laboratory Manual.
- MSRCASC Institutional Laboratory Safety Manual.
- Manufacturer's operation and maintenance manual for the relevant equipment.
- Institutional procedures for electrical/electronic equipment safety and e-waste management.

15. Document Control

Prepared by: _____

Designation: _____

Reviewed by: _____

Designation: _____

Approved by: _____

Designation: _____

Signature: _____

Date: _____

Next Review: _____

16. Student Learning Outcomes

- Students should understand the purpose and correct operation of the equipment or procedure covered by this SOP.
- Students should follow safe laboratory practices and perform the practical systematically.
- Students should record observations, calculations and results accurately.
- Students should identify common faults and report equipment abnormalities appropriately.

SOP No.: MSRCASC/DBT/ELEC/SOP-08

Title: Standard Procedure for the Use of Digital Electronics Trainer Kits and ICs

1. Objective

To establish a standardized procedure for using digital trainer kits, logic ICs and associated input/output modules.

2. Scope

Applicable to undergraduate digital electronics and microprocessor/microcontroller laboratory teaching.

3. Principle

Digital trainer kits provide regulated supplies, switches, LEDs, displays and interconnection facilities for digital circuits. Correct IC family, pinout, supply and logic-level connections are essential.

4. Responsibilities

- Faculty: Explain trainer operation and IC pin configurations.
- Laboratory Staff: Maintain trainer kits, ICs, leads and power modules.
- Students: Verify IC type and pinout and avoid powered rewiring.

5. Materials and Components

- Digital ICs specified for the experiment
- Jumper wires
- Datasheet/pinout
- Required logic components

6. Equipment Required

- Digital trainer kit
- DC supply module
- Logic probe/oscilloscope where required

7. Procedure

- Switch OFF the trainer kit before inserting ICs.
- Verify the IC number, orientation and pinout using the approved reference.
- Insert the IC carefully into the appropriate socket.
- Connect inputs, outputs, VCC and ground according to the circuit.

- Check for accidental shorts or floating connections where relevant.
- Get the circuit checked before power-on.
- Switch ON and apply input combinations systematically.
- Observe LEDs/displays/logic outputs and record the truth table or results.
- Switch OFF before changing the circuit.

8. Quality Control

- Verify supply voltage required by the IC.
- Check IC orientation and pin connections.
- Compare observed output with the expected truth table.
- Replace suspect ICs only after faculty verification.

9. Safety Precautions

- Never insert/remove ICs while power is ON.
- Do not exceed IC supply ratings.
- Avoid shorting outputs.
- Use ESD precautions where applicable.
- Do not force ICs into sockets.

10. Waste Disposal

- Damaged ICs and electronic components shall be segregated and handled through institutional e-waste procedures.
- Do not discard ICs or PCBs in general waste where e-waste collection is provided.

11. Expected Outcome

Students should be able to construct and test basic digital circuits using trainer kits and ICs safely.

12. Troubleshooting

Observation/Problem	Possible Cause	Corrective Action
No output	Incorrect IC orientation or wiring	Switch OFF and verify pinout and connections
IC heating	Wrong supply or short circuit	Switch OFF immediately and inspect supply and wiring
Unexpected logic	Floating input or wrong connection	Check input states and circuit connections

13. Records and Documentation

- Trainer kit usage register

- IC/component issue register
- Experiment/truth-table record
- Fault report

14. References

- Department of Electronics, MSRCASC – Approved Laboratory Manual.
- Manufacturer’s operation and maintenance manual for the relevant equipment.
- Institutional procedures for electrical/electronic equipment safety and e-waste management.

15. Document Control

Prepared by: _____

Designation: _____

Reviewed by: _____

Designation: _____

Approved by: _____

Designation: _____

Signature: _____

Date: _____

Next Review: _____

16. Student Learning Outcomes

- Students should understand the purpose and correct operation of the equipment or procedure covered by this SOP.
- Students should follow safe laboratory practices and perform the practical systematically.
- Students should record observations, calculations and results accurately.
- Students should identify common faults and report equipment abnormalities appropriately.

SOP No.: MSRCASC/DBT/ELEC/SOP-09

Title: Operation and Maintenance of Electronic Laboratory Equipment

1. Objective

To establish a standardized procedure for routine inspection, cleaning, storage, preventive maintenance and fault reporting of electronics laboratory equipment.

2. Scope

Applicable to laboratory power supplies, oscilloscopes, function generators, multimeters, trainer kits, soldering stations and related equipment.

3. Principle

Regular inspection and preventive maintenance improve measurement reliability, equipment life and user safety. Faulty equipment must be removed from service until appropriately assessed.

4. Responsibilities

- Faculty/Faculty In-charge: Review equipment availability and ensure safe use.
- Laboratory Staff: Perform routine checks, maintain registers and arrange authorized servicing.
- Students: Perform only user-level checks and report faults; no unauthorized repairs.

5. Materials and Components

- Approved cleaning materials
- Labels/tags for faulty equipment
- Equipment manuals
- Inspection checklist

6. Equipment Required

- Laboratory test instruments
- Cleaning accessories
- Storage cabinets/racks

7. Procedure

- Inspect equipment visually before use.
- Check power cords, plugs, connectors, displays and controls.
- Clean equipment using the manufacturer-approved method.
- Ensure ventilation openings are free from dust and obstruction.

- Check accessories and probes for damage.
- Record faults, abnormal readings or missing accessories.
- Tag and isolate equipment that may be unsafe or unreliable.
- Arrange authorized maintenance, calibration or servicing as applicable.
- Update the maintenance record after service.

8. Quality Control

- Maintain equipment identification and service status.
- Check calibration/verification status where applicable.
- Document faults and corrective actions.
- Keep maintenance records traceable.

9. Safety Precautions

- Do not open energized equipment.
- Students must not perform internal repairs.
- Disconnect equipment before cleaning.
- Use manufacturer-approved procedures.
- Do not operate equipment with exposed damage or unsafe power cords.

10. Waste Disposal

- Replaceable electronic parts and accessories shall be disposed of through approved e-waste procedures.
- Maintain segregation of batteries and other regulated waste as required by institutional policy.

11. Expected Outcome

Laboratory equipment should remain safe, functional, traceable and suitable for teaching use.

12. Troubleshooting

Observation/Problem	Possible Cause	Corrective Action
Instrument fails self-test	Internal fault or power issue	Switch OFF, tag and report for authorized service
Unstable measurement	Damaged lead or calibration issue	Check accessories and verification status
Overheating	Blocked ventilation or internal fault	Switch OFF, allow cooling and report

13. Records and Documentation

- Equipment inventory register

- Equipment usage register
- Preventive maintenance record
- Calibration/verification record
- Fault and repair register

14. References

- Department of Electronics, MSRCASC – Approved Laboratory Manual.
- Manufacturer’s operation and maintenance manual for the relevant equipment.
- Institutional procedures for electrical/electronic equipment safety and e-waste management.

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- Students should understand the purpose and correct operation of the equipment or procedure covered by this SOP.
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- Students should record observations, calculations and results accurately.
- Students should identify common faults and report equipment abnormalities appropriately.

SOP No.: MSRCASC/DBT/ELEC/SOP-10

Title: Segregation and Disposal of Electronic Laboratory Waste

1. Objective

To establish a standardized procedure for segregation, collection, storage and disposal of electronic waste generated in the Electronics Department.

2. Scope

Applicable to electronic components, PCBs, wires, batteries, damaged instruments, soldering waste and other laboratory e-waste generated during teaching and project activities.

3. Principle

Electronic waste should be segregated at the point of generation to enable safe handling, recovery and environmentally responsible disposal through approved institutional channels.

4. Responsibilities

- Faculty: Ensure students understand waste segregation and institutional requirements.
- Laboratory Staff: Maintain designated containers and coordinate authorized collection/disposal.
- Students: Segregate waste immediately and never mix electronic waste indiscriminately with general waste.

5. Materials and Components

- Damaged PCBs
- Electronic components
- Wires and cables
- Batteries as applicable
- Damaged probes/accessories
- Soldering waste

6. Equipment Required

- Clearly labelled e-waste containers
- General waste container
- Sharps-safe container where required for broken component leads/glass

7. Procedure

- Identify the waste type before disposal.

- Segregate electronic components, PCBs, cables and batteries according to institutional categories.
- Keep reusable components separate from waste.
- Do not break, burn, dismantle or chemically process e-waste in the laboratory.
- Place waste directly into designated containers.
- Keep batteries segregated as instructed by institutional procedures.
- Store collected e-waste securely until authorized collection.
- Maintain disposal/collection records.

8. Quality Control

- Containers should be clearly labelled and not overfilled.
- Maintain traceability of collected e-waste.
- Follow current institutional and applicable regulatory requirements.

9. Safety Precautions

- Do not handle damaged batteries or unknown leaking materials without appropriate instruction.
- Do not burn electronic waste.
- Do not dispose of e-waste in drains or ordinary bins.
- Report spills, damaged batteries or unsafe waste immediately.

10. Waste Disposal

- Electronic waste shall be transferred only through the institution's approved collection/disposal route.
- General non-contaminated waste shall be handled through the appropriate institutional waste stream.

11. Expected Outcome

Students and staff should be able to identify, segregate and responsibly manage common electronics laboratory waste.

12. Troubleshooting

Observation/Problem	Possible Cause	Corrective Action
E-waste container overfilled	Irregular collection	Inform laboratory staff and arrange authorized collection
Battery leakage	Damaged/old battery	Do not handle unnecessarily; isolate safely and inform staff
Reusable part discarded	Poor segregation	Inspect components before disposal and maintain a reusable-components box

13. Records and Documentation

- E-waste generation/disposal register
- Collection record
- Battery disposal record where applicable
- Incident record where applicable

14. References

- Department of Electronics, MSRCASC – Approved Laboratory Manual.
- Manufacturer’s instructions for relevant equipment.
- Applicable institutional e-waste management procedures and current Government of India requirements.

15. Document Control

Prepared by: _____

Designation: _____

Reviewed by: _____

Designation: _____

Approved by: _____

Designation: _____

Signature: _____

Date: _____

Next Review: _____

16. Student Learning Outcomes

- Students should understand the purpose and correct operation of the equipment or procedure covered by this SOP.
- Students should follow safe laboratory practices and perform the practical systematically.
- Students should record observations, calculations and results accurately.
- Students should identify common faults and report equipment abnormalities appropriately.