Safety in the electrical laboratory, as everywhere else, is a matter of the knowledge of potential hazards, following safety precautions, and common sense.

There are a number of hazards present in any electrical engineering laboratory. Therefore, for you and your partner’s personal safety, as well as the safety of the equipment, it is imperative that you observe a number of basic precautions when working in this laboratory.

Death is usually certain when 0.1 ampere or more flows through a person's head or upper thorax. Currents of one quarter to one half this value have been fatal to persons with coronary conditions. The current depends on body resistance, resistance between body and ground and the voltage source. If the skin is wet, the heart is weak, the body contact area with ground is large and direct, then 40 volts could be fatal [1]. Therefore, never take a chance on a “low” voltage.

Always observe these precautions when working in the laboratory.

FAILURE TO OBSERVE ALL SAFETY RULES WILL RESULT IN YOUR REMOVAL FROM THE LABORATORY AND FAILURE IN THE LAB AND THUS THE COURSE.

SAFETY

General

1. Always wear safety glasses!

2. Substantial footwear is required. No flip-flops or sandals are allowed.

3. In an emergency ALL BENCHTOP POWER SUPPLIES in the laboratory can be switched off by depressing the large red buttons ON THE WALLS. Locate these switches. The MAIN AC breaker on the main breaker panel removes ALL LAB POWER. These controls are to be used in emergencies only.

4. Never operate circuit breakers on the main panel except as in item 3 above.

5. Chairs and stools should be kept under laboratory benches when no one is sitting on them.

6. Whenever possible avoid having two lab groups working back-to-back. Be extra careful when two groups must work back-to-back.

7. Never use water on an electrical fire. If possible first switch laboratory power off, then use a CO₂ or dry type extinguisher. Identify the location of all extinguishers in or near the lab.

8. In case of an electric shock, quickly remove the victim from the circuit without endangering yourself. If the victim is not breathing, administer CPR while someone else phones public safety (911) to call for an emergency vehicle. Continue CPR until the victim is revived.
9. Running or practical jokes are not tolerated.

**Electrical Circuit Safety**

1. Do not work alone on energized electrical equipment.

2. Power must be switched off whenever an experiment or project is being assembled or disassembled. Discharge any high voltage points to ground with a well-insulated jumper. Remember that capacitors can store dangerous quantities of energy.

3. Make measurements in live circuits with well insulated probes and one hand behind your back. Do not allow any part of your body to contact any part of the circuit or equipment connected to the circuit.

4. Never touch electrical equipment while standing on a damp or metal floor.

5. Never handle wet, damp or ungrounded electrical equipment.

6. Wearing a ring or watch can be hazardous in an electrical laboratory since such items make good electrodes for the human body.

7. Never lunge for a falling part of a live circuit such as leads or measuring instruments.

8. Never touch two pieces of equipment simultaneously.

9. Never touch even one wire of a circuit; it may be “hot” (i.e. capable of delivering an electric shock).

10. Avoid heat dissipating surfaces of high wattage resistors and loads because they can cause severe burns.

11. Some components (particularly large wattage resistors) have exposed metal that is electrically “hot.” Take extra care when working with these components.

12. Ask the instructor to check out your constructed circuit before applying power.

**High Power and Machinery Safety**

1. When using rotating machinery, stick your necktie or necklaces inside your shirt or better yet, remove them completely.

2. Keep clear of rotating machinery. Do not be fooled by stroboscopic effects.

3. Never open field circuits of DC motors because the resulting dangerously high speeds may cause a “mechanical explosion”.

4. Keep your eyes well away from arcing points. High intensity arcs may seriously impair your vision and a shower of molten copper may permanently injure your eyes.
Laboratory Instrument Safety

1. Fuse circuits to protect ammeters and wattmeters for the current range being used.
2. Do not drop or bang instruments on the lab tables. They are delicate.
3. Never short circuit a power source.
4. When using instruments which are connected to the power line, connect all ground leads to the same point. Otherwise, a short circuit may result.
5. When using a voltmeter or ammeter, begin with the highest range and work your way down to a suitable range.
7. Keep instruments away from the edge of the work bench.

OTHER RULES

1. Use safe laboratory practices at all times.
2. No food or drink is allowed in the laboratory.
3. Do not write on bench surfaces or equipment.
4. Report defective equipment and blown fuses to the instructor.
5. Students must not replace blown fuses, move instruments from one station to another, or turn on the main or secondary circuit breakers.
6. The instructor has to inspect and initial your data before circuit disassembly.
7. Put all wastepaper, newspapers, etc. in the wastebasket.
8. Return all equipment and supplies to proper storage locations.

References


Credits and Copyright

Adapted from material developed by current and former ECE faculty, including Professor Joseph Kelemen.

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