

Safety Guidelines - Electronics Lab M831/M833 - PVCC

Purpose of this document is to ensure the safe and smooth execution of the Electronics lab. The safety rules have to be followed at all times when you are present in the teaching laboratories. Every student who participates in the lab course has to sign the safety agreement at the end of this document.

General lab guidelines and safety instructions

- Carry out the experiments in such a way that nobody will be injured or hurt.
- Carry out the experiments in such a way that the equipment will not be damaged or destroyed.
- Follow all written and verbal instructions carefully. If you do not understand the instructions, the handouts and the procedures, ask the instructor.
- Never work alone! You should be accompanied by your laboratory partner and / or the instructors all the time.
- Perform only those experiments you find in the instructions or authorized by the instructors.
- Unauthorized experiments are prohibited.
- The workplace has to be tidy before, during and after the experiment.
- Read the handout and procedures before starting the experiments.
- Intentional misconduct will lead to the exclusion from the lab.
- No food or drinks are allowed during lab times.

Electrical safety

The direct impact of electrical current to the human body can cause serious injuries and even death. The strength of injury depends on the amount of current flow, the frequency, the way the current takes through the body and the kind of current (AC or DC). Up to about 0.5mA current flow in the body is imperceptible. Above this a slight tickle is noticeable. Over 10mA there will be muscle contractions in the part of the body, which is flown through by the current. Also respiration problems take place. The hands will not be able to release things. In case of good health this is still not hazardous. For higher currents up to 200mA the duration of the current flow is important. If the current is switched off early enough there is still no effect on health. Rising probability currents over 200mA cause fibrillation, cardiac arrest ...etc. Over 500mA the body is also poisoned by chemical effects, which also can cause death even after some days.

In general, DC current is less dangerous but also shows all the described effect at higher values! In practice it's necessary to know the maximum touch voltage, which is surely innocuous. There is no absolute value definable, because the resistance of the human body differs between 600 and about 6000 Ohm. It is dependent upon the wetness of the skin, the individual person and the voltage. With higher voltage the resistance lowers!

AC \leq 50 V

DC \leq 120 V

Relatively not harmful!

Beside the risk of injury there's also a danger of fire. Damaged or broken instruments or equipment can be the cause of fire. In almost all cases the safety arrangements at the table or in the room should react immediately and switch off the power lines to prevent injuries or damages.

Handling of Semiconductor Components

Sensitive electronic circuits and electronic components have to be handled with great care. The inappropriate handling of electronic component can damage or destroy the devices. The devices can be destroyed by driving to high currents through the device, by overheating the device, by mixing up the polarity, or by electrostatic discharge (ESD). Therefore, always handle the electronic devices as indicated by the handout, the data sheet or other documentation.

An ESD event is a rapid transfer of charge from one object to another in an attempt to become electrically neutral. Electrostatic charge is most commonly created by the contact and separation of two electrically nonconductive materials. The amount and type of charge (positive or negative) depends on the materials involved. The following common materials, often found in business and laboratory environments, are all sources of static electricity:

- common plastic bags
- common packing tape
- paperwork
- common untreated plastic materials
- styrofoam parts

Controlling Electrostatic Discharge

The basics of ESD control are simple, built on the following principles:

Grounding- a means of draining the static charges present on your body, by use of a personal grounding device or a wrist strap.

Isolation involves the packing of components and assemblies during storage and transportation.

Prevention is the area where you can make the biggest difference. A number of common sense rules can be applied. These rules do not require additional materials but are extremely effective in preventing static damage.

- Always keep your workbench clean and clear of unnecessary material, particularly common plastics.
- Return ESD-sensitive items to their ESD-protective containers when not actively working with the items.
- Do not hold ESD-sensitive items like semiconductor device (diodes, transistors, integrated circuits) against your clothing.
- Don't touch sensitive items (e.g. metal oxide semiconductor field effect transistors (MOSFETs), Operational Amplifiers, Logic gate).

In conclusion:

- Don't touch open wires unless you are sure that there is no voltage.
- NEVER try to experiment with the power from the wall plug.
- Prepare a clear set-up for every experiment. Use colored wires of suitable length. Only have those wires around you really need.
- Switch off the supply if you make changes to the experiment even when the voltage is low.
- After the lab session, switch off every supply, disconnect and disintegrate the experiments.
- Immediately report dangerous or exceptional conditions to the instructor: Equipment that is not working as expected, wires or connectors are broken, the equipment that smells or "smokes". If you are not sure what the problem is or what's going on, hit the big 'Red Button' at front table. (Emergency shutdown)
- Never use damaged instruments, wires or connectors. Hand these parts to the instructor.

Agreement

I have read and agree to follow all of the safety rules. I realize that I must obey these rules to insure my own safety, and that of my fellow students and instructors. I will cooperate to the fullest extent with my instructor and fellow students to maintain a safe lab environment. I will also closely follow the oral and written instructions provided by the instructor. I am aware that any violation of these rules that result in unsafe conduct in the laboratory or misbehavior on my part, may result in being removed from the laboratory, receiving a failing grade, and/or dismissal from the course.

Please initial here:

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