Training Overview for ECE Electronics Laboratory

ECE LAB SAFETY

Watch the Lab Safety Video

https://www.youtube.com/watch?v=foz7L9SCSxg

Students then read and sign safety form.

Introduction to ECE Lab Equipment

Watch the video to familiarize yourself with the oscilloscope and function generator for Lab 1.

https://www.youtube.com/watch?time_continue=2&v=_Z9ZKCQJhiU

Exploding Components: This is shown to demonstrate what can happen if too much current is applied.
https://www.youtube.com/watch?time_continue=1&v=JCPXckfT-6g

HIgh Z Tutorial

- **How do you set high Z?**
  - Follow instructions on the sheet on top of function generator at each student's desk.
- **How do you manually check for High Z?**
  - Ensure offset is set to 0 and check minimum voltage (Peak to Peak) is 100mV if at 50mV you are in 50-ohm configuration
- **Why is High Z important?**
  - Impedance matching between source and circuitry. Reduces amount of current reflected back into the function generator, which **can cause possible damage** to equipment or your circuit under test.
  - The output amplitude value will be incorrect. The default output impedance for the function generator is 50 ohms and it assumes that the load that you are connecting the function generator to is also a 50 ohm termination (impedance matched). For example, if you want 1.0V to be applied to your circuit, the function generator will generate 2.0V. It automatically takes into account the 50 ohm termination which results in a voltage divider network of 0.5. However, if the load is a high impedance load for example an oscilloscope input channel, then the oscilloscope measured input voltage will be 2.0V as shown below. **Ensure you are in the High Z mode for correct function generator output values applied to your circuits.**
  - Additional info:
    - https://www.keysight.com/main/editorial.jspx?ckey=1948055&id=1948055&nid=-11143.0.00&lc=eng&cc=MY
  - About High Z mode video:
    - https://www.youtube.com/watch?v=fOJ1aExSkhw
  - Don't fall into the high impedance trap! Video
  - https://www.youtube.com/watch?v=e446nQ9cXdc

ESD Basics

- It is important to realize that your parts can be damaged from charge buildup in the room, table, floor, people, etc. This is known as Electrostatic discharge (ESD).
- Several thousand volts can be generated when two surfaces are rubbed together and this voltage can be discharged through your circuit components when you touch them if you are not wearing your wrist strap.
- Review the presentation on ESD basics in D2L site for Lab 1.

Wiring Breadboards

- Breadboards are not designed for high frequency. 1MHz frequency is the upper limit. There is too much stray capacitance from the wires and connections.
- The breadboard socket takes a 24 gage wire that has 1/4inch of insulation removed.
- Treat the breadboard with care. Insert wires that are straight. Don't force them in.
- ICs are easy to push into holes but they can be hard to remove by hand. Use a tool such as a chip puller or a screw driver to gently pry each end until it comes out easily.
- Color code your wires to make it easier to trace wires to and from components. (e.g. power-red, ground-black, signal-blue, green, yellow, etc.)
- Some videos on best wiring practices for breadboards:
    - https://www.youtube.com/watch?v=4F3NueYBQUg
    - https://www.youtube.com/watch?v=ver-Av8vr1Q

Additional Notes

- Liquids must be kept in a closed container, that would not spill if it tumbles, on a table next to exit of the lab
- Closed toe shoes must be worn at all times.
- Mat etiquette
- Students would have to wait for yellow light to appear on Stockroom window before checking in to the lab by depositing Catcard at stockroom windows