Senior Design Lab Use and Safety

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Where do I get Help?
If in doubt, don’t do it! We are here to help! Ask questions!

• TAs (They’ve seen it all.) – This should always be the first stop.
• Professors (They have nightmares about things they’ve seen.)
• Lab Coordinator (I have all my fingers.) cjsmith0@illinois.edu
• Electronics Shop (They don’t like fixing the things you break. Set appointment with your TA for soldering advice.)
• Parts
  • ECE Supply Center
    • www.ece.illinois.edu/about/shop/
• PCBs
  • Electronics shop has rapid prototyping equipment
    • eshop.ece.illinois.edu/pcbdesign/pcbdesign.php
• Kits
  • Electronics shop (eshop.ece.illinois.edu)
Bench Setups

Typical: $8,500
Power: $16,500
RF: $35,500
Soldering Stations

SMD

General
Equipment Damage

• Check Ratings
  • Does the function and ratings of the instrument match the signals you are attempting to measure?
  • If in doubt ask!

• Understand how probes and sources are grounded
• Some instruments are fused but some damage is permanent.

• Common safety related issue

• Report malfunctioning equipment
  • E-mail ece-eshop-repairs
  • ‘Red Tag’ equipment
Lab Kits

- TAs will sign out with form provided by electronics shop.
- When replacing a kit check in old kit as returned, and fill out new form for replacement kit. You are responsible for cost of replacement if lost!
- JAM 101: Do not cram too much into lockers. Items pressing against lock make lockers very difficult to get open.
Senior Design Lab Policy

• Minimize use of instructional labs
  • ADSL - ECEB 2076 is used only by ECE 395.
  • Power Lab - ECEB 4024 is not to be used without special permission.
  • Wireless Lab - ECEB 5080 is not to be used without special permission.
  • Open Lab – ECEB 2024 – No coursework.

• Do not plan to use instructional lab equipment in your design. (ECE 385, 343…)

• Please do not move tethered equipment from bench or remove from lab.

• No working alone in lab.

• Please be considerate of your labmates and keep the lab clean and safe.
Keep it clean

• NO FOOD IN LABS!
  • Exception for sealed water bottles.
  • Keep them on floor, not on workbenches.

• Clean your bench!
  • Clean benches after sessions.
  • Cables on hangers / Probes in Bins
  • Kits and components in cabinets
  • Email if you need clearing supplies.

• End of Semester
  • As part of your final checkout you will be responsible for cleaning your work area.
  • Take 10 Minutes: Every time you’re in the lab take some time to organize and clean. It adds up.
What is “clean” anyway?

This

NOT this
Senior Design Lab Policy

• No-tolerance lab policy
  • If soldering irons are left on, or the lab is exceedingly messy, the lab will be closed for at least 24 hours, or until further notice, for each infraction.

• Sign logbook for the soldering room
  • TAs and instructors will be randomly conducting checks throughout the semester. If a student is found using the soldering room without signing in, the student will be penalized.
Keep it safe

• To be safe you must understand the dangers present in the lab.

• This requires learning about the equipment and materials present. Talk to your TA!

• Crisis situations are not the time for careful thought. Look at the lab to identify potential hazards and plan for safety scenarios.

• Implement – Thinking about it is not enough! Make improvements in the lab and communicate risks to staff before (and as) they arise!
Potential Power Hazards

• Electrical shock and Electrocution
  • Amount of Current (AC 1s ~10ma painful, >100ma heart)
  • Current path through body
  • Time body is in circuit

• Burns
  • Too much current through a conductor = heat. As little as 1W can cause burns for small parts.

• Fires
  • Using improperly rated conductors
  • Sparks due to poor connections or insulation
  • Batteries – Shorts and improper charging
Battery Safety

• Do not use a battery when a bench power supply will do. Talk to your TA!
• Store batteries in Yellow storage locker. Transport in battery bag and ammo box.
• Lead-acid batteries exhaust H when charging. Uncontrolled fast charging can create direct fire hazards.
• The short-circuit currents can be extreme. A good 100 A-h battery can deliver >5000 A of short-circuit current. Don’t short!
• Lithium cells can experience thermal run-away when improperly charged. Nasty fires and out-gassing.
• Batteries require terminal covers, proper ventilation, and validation that the circuits used will not have fail-short modes.
Rules to live by

• When AC wall potential is used an instructor or TA must be present. No working alone!
• Don’t make changes to a circuit when power is applied. Always treat cases as electrically live & do not leave circuits exposed.
• Avoid presenting body as ground path. One Hand Rule.
• Do not defeat ground connections with adaptors.
• Use wiring of appropriate length and gauge. Does it smell hot?
• Understand storage of energy in inductive and capacitive circuits even when power is removed.
  • Capacitors can hold charge a long time after power is removed and deliver that charge very rapidly.
  • Current cannot change in inductors instantly. Don’t forget motors are inductors!
If a Problem Occurs

• Tend to your immediate safety first! Leave area if necessary and get help!
• Shut off power
• Locate problem before power is restored
• If circuit breaker is tripped, report to ece-eshop-repairs to reset
• If help is needed contact me or electronics shop for assistance
• In event of an accident or emergency call 911
First Aid Stations

- First Aid Kits considered single use. Report all use to me for restock.
- Report all injuries to course staff immediately.
- Land-Line phone works in event of cell phone or power interruption.
- In event of an accident or emergency call 911
Safety Information

- Information about potential hazards and chemicals in the labs.
- Spill kit and firebox located near extinguisher at back of room.
Fire Safety

- Plan ahead: Identify closest alarm pulls and exits.
- Identify location of fire extinguishers in your lab. (If equipped)
- Personal safety comes first. Pull alarm, and evacuate building.
- Assemble in grassy area East of ECEB
BEAP

- **Building Emergency Action Plan**
  - Each floor has floor coordinator.
  - Areas of rescue assistance with marked call boxes.
    - SW Stairwells on floors 2-3.
    - E & W Stairwells on Basement and floors 2-5.

- **Get Out / Run**
  - Fire, Earthquake, Finals Week, Etc
  - Evacuation assembly areas are grassy area E of ECEB outside main lobby or inside Beckman Institute Atrium in bad weather.

- **Stay In / Hide**
  - Storms
    - Refuge areas in basement and interior hallways and bathrooms.
  - Security Threat
    - Secure your classroom or lab.
    - Run / Hide / Fight