

Safety Module 2 - Safety in the Dept. of Elec. and Comp. Eng.

Creating a Safe Workspace

A key to successful and safe activity is maintaining an organized and appropriate workspace. Your workspace should have adequate lighting, proper ventilation, unrestricted movement, and a clear emergency exit. It's vital to be mindful of the objects, equipment, and people in your vicinity.

Awareness of Surroundings

Before starting any work, assess your surroundings. Ask yourself:

1. Will others in the area interfere with your work or vice versa?
2. Is it safe to conduct your research with others nearby?
3. Are you and those around you equipped with the necessary PPE?

Avoid interrupting someone engaged in activities like working with power tools, live circuits, or tasks requiring deep focus. Always wait until they are ready to engage safely.

Preparing Your Workspace

Your workspace will be assigned by your supervisor and supported by technical staff. Ensure that your area is:

- **Free of Clutter and Organized:** Keep all items in designated places when not in use, use drip bins under unused machines, and maintain a tidy floor.
- **Ergonomically Setup:** Your workspace should be at an appropriate height, especially for tasks like soldering or working on electrical circuits.
- **Properly Ventilated:** Ensure adequate ventilation when working with tools or materials that generate dust, particulates, or emit noxious gases.
- **Well-Lit:** Bright lighting is crucial unless your task requires dim lighting, in which case, notify others and post appropriate signage.

Approval of Work Plan and Setup

Although you are the project manager of your work, you must obtain approval from your supervisor, technologists, or department manager before starting work that involves physical fabrication. Ensure you are properly trained and have demonstrated competence with the tools and equipment you'll use.

Basic Lab Safety Guidelines

- No food or drinks allowed.
- Tie back long hair.
- Wear appropriate PPE.
- Clean up all equipment and workspaces after use.
- Wash your hands after working or taking a break.

- Be aware of others in your proximity.
- Remember, your assigned space is your responsibility.

In laboratories of the Dept. of Electrical and Computer Engineering, you will encounter various forms of energy, including electrical, microwave, radio waves, electromagnetic, mechanical, and fluid/gas energy. Understanding the risks associated with these energies is critical for your safety.

Electricity requires a complete circuit to flow. An electric shock occurs when the body contacts two points of different voltage levels. Even as little as 50 volts can be lethal under certain conditions. Currents above 25 mA can cause ventricular fibrillation, potentially fatal without immediate aid. The electrical resistance of the human body varies greatly, with dry skin offering higher resistance than wet or broken skin, making higher voltages particularly dangerous.

Workplace Electrical Safety Training

- Always use a voltage measuring instrument to first touch any part of a live circuit.
- For experiments requiring more than 50 V, use insulated tools, rubber-soled shoes, and avoid wearing conductive materials.
- Power down and unplug equipment after use, and ensure capacitors are discharged before handling high-voltage components.
- Verify that all equipment enclosures are properly grounded.
- Avoid operating equipment in wet areas.

Electrical Equipment and Components

- **Resistors:** Overloading can cause resistors to burn or explode.
- **Capacitors:** Incorrect polarity or overvoltage can cause capacitors to explode.
- **Inductive Circuits:** Sudden disconnection can cause dangerous voltage spikes.
- **LiPo Batteries:** Only charge with manufacturer-approved chargers and store in fireproof cabinets. Damaged batteries should be removed from service immediately.
- **Car Batteries:** Exercise extreme caution with tools around batteries, ensuring protective covers are used and working in well-ventilated areas.
- **Electrical Cords:** Avoid overloading extension cords, and never connect multiple cords to extend their length.

Safe Use of Electrical Cords and Tips

- Avoid connecting multiple power strips or extension cords.
- Circuit/fuse boxes should be locked and controlled by qualified personnel.
- Replace frayed cords and broken plugs immediately.
- Keep extension cords off the floor to prevent tripping hazards.
- Never remove the ground pin from a plug, and always pull from the plug, not the cord, when unplugging devices.

Soldering Safety

Solder vapors are harmful; always use a vent hood or fan. Wear splash-resistant safety glasses and handle soldering irons with care to prevent burns or fires. Soldering irons must be placed in approved receptacles when not in use.

Ergonomics and Wellness in a Computer-intensive Work Environment

Carpal Tunnel Syndrome (CTS) Prevention

Carpal Tunnel Syndrome is a condition caused by pressure on the median nerve as it passes through the wrist, leading to pain, numbness, and tingling in the hand and fingers. It is common among individuals who perform repetitive hand movements, such as typing or using a mouse.

- Keep your wrists straight, not bent, while typing or using the mouse. Consider using a wrist rest or a keyboard tray that allows your wrists to remain flat.
- Regularly perform wrist and hand stretches to maintain flexibility and prevent the buildup of tension in the carpal tunnel. Stretching before and after prolonged typing sessions can be particularly beneficial.
- Take short breaks every 20-30 minutes to rest your hands and wrists. Shake out your hands or perform gentle stretching to relieve tension.

Insomnia Prevention

Insomnia is a sleep disorder characterized by difficulty falling asleep, staying asleep, or waking up too early and not being able to go back to sleep. It can lead to fatigue, irritability, and difficulty concentrating during the day, all of which can potentially affect safety.

- Avoid using screens (computers, smartphones, etc.) at least an hour before bed, as the blue light emitted can interfere with your sleep cycle. Consider using blue light filters or night mode on your devices if you must use them.

Deep Vein Thrombosis (DVT) Prevention

Deep Vein Thrombosis is a condition in which a blood clot forms in a deep vein, usually in the legs. Prolonged sitting or inactivity can slow blood flow in the veins, increasing the risk of clot formation. DVT can lead to serious complications if the clot travels to the lungs (pulmonary embolism).

- Avoid sitting for extended periods. Take short breaks to stand up, stretch, and walk around every hour to promote blood circulation in your legs.
- While sitting, perform simple leg exercises such as ankle circles, leg lifts, or calf raises. These exercises help keep the blood flowing and reduce the risk of clot formation.
- Drink plenty of water throughout the day. Proper hydration helps maintain blood viscosity and circulation.

When is LOTOTO Required?

LOTOTO (Lock Out, Tag Out, Try Out) is necessary whenever there is potential exposure to harmful energy levels. Only trained personnel should perform LOTOTO. If live circuit work is required:

- Wear appropriate PPE, including protective eyewear and rubber-soled shoes.
- Understand correct measurement points and be trained in using measuring devices.
- Eliminate distractions, keep the work area uncluttered, and avoid working alone.

Example: A student needs to work under a large hydraulic ram.

The hydraulic pump disconnect needs to be locked and tagged in the off position. The hydraulic ram needs to be blocked from moving. Only the person who performed the lockout is allowed to remove the lock.

Safety in the lab is a collective responsibility. By adhering to these guidelines, you can ensure a safe and productive environment for yourself and others. Remember, your workspace and equipment are your responsibility—maintain them diligently to prevent accidents and ensure successful outcomes in your work.