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جامعة تبوك
University of Tabuk

Faculty of Engineering

University of Tabuk

Laboratory Safety Policies and Procedures

The Faculty of Engineering Laboratory Safety Policies and Procedures (LSPP) Committee coordinates and monitors laboratory safety functions and guidelines associated with teaching laboratories. In fulfilling the responsibilities, the Committee developed this manual for the laboratories. It provides safety standards for all individuals participating in teaching laboratories including but not limited to technicians, instructors, staff, and students.

General Considerations

All faculty, staff, and technicians in teaching laboratories must attend the applicable training workshops that include many sessions at the beginning of each year. These workshops include:

- Safe Laboratory Practices Training: This training will inform them of best laboratory safety practices including personal protective equipment, mechanical control, chemical use and storage procedures, chemical waste procedures, and emergency incident procedures.
- Teaching Laboratory Safety Training: The Instructors of laboratory classes must provide a training session to their students during the first class meeting regarding the specific lab safety considerations. Students must sign an affidavit for each class that has a lab in which they are enrolled.

Instructors must ensure the teaching assistants are aware of any hazards that may be present while teaching the course. This includes electrical, mechanical, or chemical.

Safe Laboratory Procedures

Safety equipment must be available in all instructional laboratories to prevent or reduce exposure to harm. Teaching laboratories using hazardous chemicals must have safety equipment such as a chemical fume hoods, biosafety cabinet, eyewash station, safety shower, fire extinguisher, first aid kit, and spill kit. Furthermore:

- All teaching laboratory occupants must know where the safety equipment is located and how to use them in case of emergency.
- Teaching laboratory occupants must wear appropriate personal protective equipment such as lab coat, goggles, face shield, and gloves when working with chemicals.
- Each laboratory must contain a waste container for broken glass, sharp metal, etc…
- Students must be aware that refusal to comply with safety standards will result in dismissal from the lab, and students may not be allowed to make-up missed work.
- Each teaching laboratory must have a copy of this manual accessible to all occupants.

Emergencies

Injury - Most injuries encountered in teaching laboratories will require minor first aid. These injuries could include bumps, scrapes, minor burns, and cuts. These, for the most part can be handled with a first aid kit. If additional health care is needed direct the injured party to the health services and call **014.456.2555 or 911**.

If a student is more seriously injured additional medical care maybe needed. More serious injuries could be any of the following but not limited to life in jeopardy, unconsciousness, substantial loss of blood, broken arm or leg, burns to a major portion of the body, or loss of eye sight. Administer first aid and contact **014.456.2999**.

Fire - During the first day of class, the course Instructor must go over the following instructions with the class to prepare students for a fire or other emergency evacuation situation:

- Know the locations of fire exits in the building, and paths of egress. Know the location of fire extinguishers and alarm systems and know how to use them. Advise students to gather at a designated assembly location.
- In the event of a fire, leave the room, contact the instructor, activate the building alarm, yell or shout “fire, fire, fire” and dial **911**.
- For large fires do not attempt to fight or extinguish the fire, evacuate all rooms and close all doors to confine the fire and reduce oxygen flow. Do not lock the doors. Dial **911**.
- When a building evacuation alarm is sounded, an emergency situation exists. If it is safe to do so, turn off equipment, machines, burners, hotplates, etc... Walk quickly to the nearest exit and alert others to do the same.
- Assist the physically disabled in exiting the building. Do not use the elevators during a fire. Smoke is the greatest danger in a fire, so stay low near the floor where the air will be less toxic.
- Once outside, move to a clear area at least away from the affected building. Keep streets, fire lanes, hydrants and walkways clear for emergency vehicles and crews.
- Provide emergency crews with information as requested.

Chemical Spill - If a small amount of chemical is spilled and the chemical is not acutely hazardous, then the instructors can clean up the spill. All materials used to clean up the spill must be disposed of as hazardous waste. If the chemical spilled

has toxic vapors, evacuate the laboratory and call Environmental Health and Safety at **014.456.1600**.

Mechanical Safeguards

To prevent injury:

- Prior to using the equipment students must receive training from the instructor in the operation of the equipment including safety precautions.
- Everyone must follow manufacturer's specifications.
- Do not reach around, under, over or through guards into hazardous areas.
- Do not remove or defeat safety guards.
- Do not reach into equipment to remove stuck or jammed material.
- Do not bypass electrical safety procedures or equipment.
- Wear appropriate personal protective safety equipment.
- Never leave machines unattended with parts still moving unless machine designed for it.
- Do not wear loose clothing or jewelry around moving parts.
- Immediately report any problems to the instructor.
- If the equipment does not look correct or is malfunctioning, do not use it. Contact the instructor.

Waste Management

To avoid injury:

- Waste containers may be located in the individual laboratories or in a central storage location.
- All waste containers must be closed except when adding materials.
- Chemical waste containers must be labeled as such, and be labeled with the contents.
- Sharp objects must be disposed of correctly.

Student Affidavit

I agree on the following:

- No food, drinks, or smoking in labs.
- Goggles are to be worn when any chemical, in any amount, is used including preservatives and stains. Goggles also need to be worn when there is the possibility of an object impacting the eye.
- Appropriate footwear must be worn at all times. The feet must be adequately covered (the foot must be totally covered up to the ankle). Therefore, sandals, backless and open-toed shoes are not acceptable.
- Clothing appropriate for laboratory safety must be worn. Clothing must be worn which completely covers the entire leg from the waist to the ankle. Clothing must be worn which completely covers the torso from the waist to the neck. Shoulders must be completely covered and sleeves must be worn that cover the arm from the shoulder to at least halfway to the elbow. Therefore, tank tops, halters, shorts, cutoffs, etc. are not acceptable. Some labs may require the use of a lab coat and/or gloves.
- Backpacks and other bags should be placed in the shelving units provided.
- Materials are to be disposed of immediately after use and in the proper containers.
- Never leave an experiment unattended.
- Never leave a solution on a hot plate unattended.
- Hotplates that have been turned off, but are still hot, should have a warning note in front of them.

IF THERE IS A SERIOUS ACCIDENT, CALL 911 IMMEDIATELY. OTHERWISE CONTACT THE INSTRUCTOR.

I have read the safety guidelines listed above and understand that non-compliance will result in my dismissal from the laboratory until I do comply, and I will not be allowed to make-up missed work resulting from that dismissal.

Sign_____ Course #_____

Print Name_____ Section #_____

Specific Lab Safety Considerations

Civil Engineering Department

The following are rules that relate to almost every civil engineering laboratories (Surveying Lab, Highways Engineering Lab, Hydraulics and Fluid Mechanics Lab, Materials Engineering Lab, and Soil Mechanics and Foundations Lab). They cover what one should know in the event of an emergency, proper signage, safety equipment, safely using laboratory equipment, and basic common-sense rules:

- Personnel safety equipment must be used all times while in the laboratory.
- Ensure you are fully aware of your facility's/building's evacuation procedures.
- Make sure you know where your lab's safety equipment—including first aid kit(s), fire extinguishers, eye wash stations, and safety showers—is located and how to properly use it.
- Know emergency phone numbers to use to call for help in case of an emergency.
- Open flames should never be used in the laboratory unless you have permission from a qualified supervisor.
- Make sure you are aware of where your lab's exits and fire alarms are located.
- If there is a fire drill, be sure to turn off all electrical equipment and close all containers.
- Do not chew gum, drink, or eat while working in the lab.
- Laboratory glassware should never be utilized as food or beverage containers.
- Each time you use glassware, be sure to check it for chips and cracks. Notify your lab supervisor of any damaged glassware so it can be properly disposed of.
- Never use lab equipment that you are not approved or trained by your supervisor to operate.
- If an instrument or piece of equipment fails during use, or isn't operating properly, report the issue to a technician right away. Never try to repair an equipment problem on your own.
- Do not work alone in the lab.
- Never leave an ongoing experiment unattended.
- Never lift any glassware, solutions, or other types of apparatus above eye level.
- Never smell or taste chemicals.
- Do not pipette by mouth.
- Make sure you always follow the proper procedures for disposing lab waste.
- Report all injuries, accidents, and broken equipment or glass right away, even if the incident seems small or unimportant.
- If you have been injured, yell out immediately and as loud as you can to ensure you get help.

- In the event of a chemical splashing into your eye(s) or on your skin, immediately flush the affected area(s) with running water for at least 20 minutes.
- If you notice any unsafe conditions in the lab, let your supervisor know as soon as possible.

For Emergency dial 911

Specific Lab Safety Considerations

Electrical Engineering Department

The following instructions pertain to most labs (machines and energy, circuits, control, digital logic, embedded systems, electronics, electromagnetics, scientific computing, communication, and computer lab).

Control Lab

- The following are rules cover what you should know in the event of an emergency, proper signage, safety equipment, safely using laboratory equipment, and basic common-sense rules.
- Be sure to read all fire alarm and safety signs and follow the instructions in the event of an accident or emergency.
- Ensure you are fully aware of your facility's/building's evacuation procedures.
- Make sure you know where your lab's safety equipment—including first aid kit(s), fire extinguishers, eye wash stations, and safety showers—is located and how to properly use it.
- Know emergency phone numbers to use to call for help in case of an emergency.
- Open flames should never be used in the laboratory unless you have permission from a qualified supervisor.
- Make sure you are aware of where your lab's exits and fire alarms are located.
- PCT-100 Control Unit Safety Rules
- If there is a fire drill, be sure to turn off all electrical equipment and close all containers.
- Do not chew gum, drink, or eat while working PCT-100 unit.
- Sump Tank should never be utilized as food or beverage containers.
- Each time you use sump tank or process tank, be sure to check it for chips and cracks. Notify your lab supervisor of any damaged glassware so it can be properly disposed of.
- Never use PCT-100 equipment that you are not approved or trained by your supervisor to operate.
- If an instrument or piece of equipment fails during use, or isn't operating properly, report the issue to a technician right away. Never try to repair an equipment problem on your own.
- When you finish working with PCT-100 make sure to turn off all switches in the panel.
- Do not work alone with PCT-100

- Never leave an ongoing experiment unattended.
- Never lift any tank in the kit
- Use distilled or deionized water to fill the sump tank .
- Make sure that the overflow valve on the top of the process tank is open.
- Report all injuries, accidents, and broken equipment or glass right away, even if the incident seems small or unimportant.
- If you have been injured, yell out immediately and as loud as you can to ensure you get help.
- If you notice any unsafe conditions in the PCT-100 kit, let your supervisor know as soon as possible.
- Never work with wet hands on the kit.
- After performing an experiment, you should always wash your hands with soap and water.
- Make sure all electrical panels are unobstructed and easily accessible.
- Whenever you can, avoid using extension cords.

Machines and Energy Lab

To develop a healthy respect for electricity, it is important to understand how it acts, how it can be directed, what hazards it presents, and how these hazards can be minimized through safe laboratory procedures.

It is a good idea in any lab where electricity is used to learn where the master disconnects is in case of emergency. All students should be aware of elementary first aid and what to do if an accident occurs, either to themselves or another student.

Few suggestions to avoid chocks and safety regulations for electric machines and energy lab:

- DON’T ever turn power on until the circuit is checked.
- DO be ready to turn the power off fast.
- DON’T ever clown around.
- DO make connections with one hand.
- DO turn the power off after every use.
- DO be prepared ahead.
- DO put everything carefully away after use.
- DO keep leads neat and area clean.
- DO follow instructions.
- Open and free wires shall be avoided before energizing the circuit.
- Do not energize any circuit until the instructor checks it.

- The supply voltage of the table is 220 VAC only. Please check the voltage rating of any equipment before plugging into the table sockets. Use proper supply voltage for all the equipment in the lab. If a 110 VAC supply is needed then ask the technician to provide it
- The range of difference power equipment should be correctly selected in right time. Do not overload any equipment / instrument
- Seek help of your instructor for any doubt about the circuit connection.
- Modification to the circuit may only be performed when the system is switched off (zero voltage/ zero current)
- Always use the coupling and shaft end guards to protect against contact to rotating parts.
- After finishing the experiment, turn off all the supply and bring them back to zero reading before dismantling the circuit. The first connections to be removed during dismantling the circuit are connections from all the voltage supplies.
- Normally it is not required to open the device's housing. However, if necessary to open the housing then it must be performed by lab technician and under the condition only when the mains plug and all connecting
- leads have been disconnected.
- Attention should be given to the proper routing of the cables related to experiment when connecting the rotating machines. Cables should never come into contact with rotating components
- Machines are to be positioned immediately adjacent to one another with their base please securely bolted together
- Connect the thermal switch of the motor to the "TEMP CONTROL" on the control unit.
- Connect all the "PE" or ground connections present on the motor, generator and the tacho generator panels to the "PE "connection of the supply.
- When a DC motor is removed from its power source then subsequently driven by at the cradle dynamometer it can go into generator operation, thus producing voltage which will continue to be present at its terminals.
- Safety of working shall be strictly observed and maintained by one of the group member throughout the experiment time.
- Push the emergency button "RED BUTTON" present on the experiment table in case of any emergency or safety related events.

For Emergency dial 911

Circuits, Electronics, Embedded Systems, Electromagnetic, Communication, Digital Logic, and Computer Labs

- Do not work alone on energized electrical equipment.
- Power must be switched off whenever an experiment 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.
- Never handle wet, damp or ungrounded electrical equipment.
- Wearing a ring or watch can be hazardous in an electrical laboratory since such items make good electrodes for the human body.
- Never lunge for a falling part of a live circuit such as leads or measuring instruments.
- Never touch even one wire of a circuit; it may be “hot” (i.e. capable of delivering an electric shock).
- Avoid heat dissipating surfaces of high wattage resistors and loads because they can cause severe burns.
- Some components (particularly large wattage resistors) have exposed metal that is electrically “hot.” Take extra care when working with these components.
- Ask the instructor to check out your constructed circuit before applying power. High Power and Machinery Safety
- Laboratory Instrument Safety
- Fuse circuits to protect ammeters for the current range being used.
- Do not drop or bang instruments on the lab tables. They are delicate.
- Never short circuit a power source.
- When using instruments which are connected to the power line, connect all ground leads to the same point. Otherwise, a short circuit may result.
- When using an ohmmeter, never measure resistance in a live circuit.
- Keep instruments away from the edge of the work bench.

Other Considerations:

- No food or drink is allowed in the laboratory.
- Do not write on bench surfaces or equipment.
- Report defective equipment and blown fuses to the instructor.
- Students must not replace blown fuses, move instruments from one station to another. 5. Put all wastepaper, newspapers, etc. in the wastebasket.
- Return all equipment and supplies to proper storage locations.

For Emergency dial 911

Specific Lab Safety Considerations

Mechanical Engineering Department

All students must understand and agree to the information in this document, and must sign the declaration prior to undertaking any work in the laboratory. The following applies to Mechanics of Material and Material Engineering, Fluid Mechanics and Hydraulic Machines, Mechanical Systems, Refrigeration and Air Conditioning, Heat Transfer Thermodynamics Combustion, Mechanics of Machines and Mechanical Vibrations, Energy, and Mechanical Engineering Wokshop.

- Wear eye protection at all times in the laboratory.
- Shoes must completely cover the foot. No sandals are allowed.
- Dress properly during all laboratory activities. Long hair, dangling jewelry, and loose or baggy clothing are a hazard in the laboratory. Long hair must be tied back and dangling jewelry and loose or baggy clothing must be secured.
- Never work in the laboratory alone, always have another qualified person in the area
- Wearing an "AirPods" or other device that interferes with hearing is not allowed.
- Do not use any equipment unless you are trained and approved as a user by your instructor or staff. Ask questions if you are unsure of how to operate something.
- Perform only those experiments authorized by the instructor. Never do anything in the laboratory that is not called for in the laboratory procedures or by your instructor.
- Carefully follow all instructions, both written and oral. Unauthorized experiments are prohibited.
- Don't eat, drink, or smoke, in the laboratory
- Don’t yell, scream, or make any sudden loud noises that could startle others who are concentrating on their work.
- If any laboratory equipment is malfunctioning, making strange noises, sparking, smoking, or smells "funny,” Get an instructor or staff immediately. It is imperative that the instructor or staff knows of any equipment problems.
- All accidents, no matter how minor, should be reported to the faculty/staff member supervising the laboratory immediately.
- Keep aisles clear and maintain unobstructed access to all exits, fire extinguishers, electrical panels, emergency showers, and eyewashes.
- Do not use corridors for storage or work areas.

- Avoid using extension cords whenever possible. Extension cords should not go under doors, across aisles, be hung from the ceiling, or plugged into other extension cords.
- When using compressed air, use only approved nozzles and never direct the air towards any person.
- Guards on machinery must be in place during operation.
- Exercise care when working with or near hydraulically- or pneumatically-driven equipment. Sudden or unexpected motion can inflict serious injury.
- Flammable chemicals must be stored in an Approved Flammable Storage Cabinet
- No painting in laboratories or in the building (except in an approved designated area)
- No running gas or diesel powered engines in the laboratories (except IC EngineLaboratory).
- Make sure all chemicals are clearly and currently labeled with the substance name, concentration, date, and name of the individual responsible.
- All pressurized containers (e.g. gas cylinders) will be secured with two welded link chains and label all ingredients to show nature and degree of hazard.

Specific Lab Safety Considerations

Industrial Engineering Department

The following guidelines apply to all laboratories (Industrial Automation and Control, manufacturing and production, human factors and ergonomics, and computer labs).

General Laboratory Safety

- Keep aisles clear.
- Maintain unobstructed access to all exits, fire extinguishers, electrical panels, emergency showers, and eyewashes.
- Do not use corridors for storage or work areas.
- If leaving a lab unattended, turn off all ignition sources and lock the doors.
- Do not store heavy items above table height. Any overhead storage of supplies on top of cabinets should be limited to lightweight items only.
- Spills should be cleaned up immediately.
- Be careful when lifting heavy objects. Lift comfortably, avoid unnecessary bending, twisting, reaching out, and excessive weights, lift gradually and keep in good physical shape.

Electrical Safety

- Electrical equipment must be protected (i.e., "grounded") when used near any water source. If water or fluid is spilled in or around electrical equipment, FIRST shut off circuit breaker, then unplug the equipment before cleaning up the spill.
- Avoid using extension cords whenever possible. If you must use one, obtain a heavy-duty cord that is electrically grounded with its own fuse, and install it safely. Extension cords should not go under doors or across aisles, and should not be hung from the ceiling or plugged into other extension cords.

Mechanical Safety

- When using compressed air, use only approved nozzles and never direct the air towards any person.
- Guards on machinery must be in place during operation.
- Exercise care when working with or near hydraulically- or pneumatically-driven equipment. Sudden or unexpected motion can inflict serious injury.
- Hearing protection must be worn when excessive noise levels exist.

- Loose clothing, watches, rings and other accessories or other similar items that could get caught by the moving parts of the machinery should not be worn.
- Machines and tools should always be visually checked before operating and cleaned after each use.
- No eating or drinking inside the labs and workshop.
- Frequently used hand tools receive regular proper housekeeping.
- Machines designed for a fixed location should be securely anchored to prevent movement.

Chemical Safety

- Make sure all chemicals are clearly and currently labeled with the substance name, concentration, date, and name of the individual responsible.
- All pressurized containers (e.g., gas cylinders) will be moved and installed only by staff personnel.
- Secure all gas cylinders and label all chemicals to show nature and degree of hazard.
- Use volatile and flammable compounds only in a fume hood. Procedures that produce aerosols should be performed in a hood to prevent inhalation of hazardous material. Be sure the fan is on always when using a fume hood. Fume hoods should not be used for storage.
- Material Safety Data Sheets (MSDS) shall be provided for all hazardous chemicals before use. MSDS shall be kept in a predetermined area for each laboratory.
- Clean up of large spills should not be attempted by students or teaching assistants. Ask a faculty member for help. Evacuation of a laboratory should be conducted in the event of a large chemical spill.
- Know the proper use of chemicals and proper disposal of waste. The Professor or Laboratory Instructor can supply this information.

Policies related to the safety of computer software

- Safety against Viruses/Malware: Antivirus is installed on all PCs in the college. This is configured for automatic updates and real-time scanning.

- Software Piracy: All software tools used within the college are legal and licensed. The installation and use of illegal and/or unlicensed software tools is strictly forbidden.