CECS LABORATORY SAFETY MANUAL

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1. Purpose

Safety for students, staff, and faculty is the top priority in the College of Engineering and Computer Science at VinUniversity. This manual is a safety reference document for laboratory personnel at the College of Engineering and Computer Science, VinUniversity. This safety manual describes policies and procedures that govern access to laboratories, handling of hazardous materials, inspection, and inventory control. Anyone accessing and using equipment or handling materials in laboratories within the College must follow accepted procedures and adhere to the published policies.

2. Scope

In the College of Engineering and Computer Science, there are thirteen teaching laboratories. Most hazards encountered fall into physical category. This regulation applies to all faculty, staff, and students of VinUniversity.

3. Procedural Principles

Each laboratory that uses hazardous materials must have a copy of this manual readily accessible to personnel in the laboratory.

Each laboratory personnel must be familiar with the contents that pertain to his or her workplace and the procedures for obtaining additional safety information needed to perform his or her duties safely.

In order to keep the contents of this manual up-to-date with current regulations and best practices, this Laboratory Safety Manual may periodically be rewritten, with added or deleted sections. Comments and suggestions for improving the manual are welcome and encouraged. Please send comments to:

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4. Procedural Statements

This manual specifies laboratory safety policies and standards.

Hazards can cause injuries, loss of physical or cognitive functions, or even death. It is everyone's responsibility to maintain laboratory safety and report any suspected hazards to theright personnel, immediately. Laboratory managers should assess the risks and identify hazardsperiodically. Once assessed and identified, specific standards and policies must be developed. Students, staff, and faculty using the laboratory must be trained and learn developed policies and procedures.

4.1. Laboratory Access Control Measures

The use of Engineering and Computer Science facilities is only for CECS students, staff, and faculty, except for Superlab and Computer labs. Superlab and Computer labs can be used by students, staff, and faculty of other colleges who have classes registered to use these labs.

To access laboratories, students must have ***completed appropriate training, signed the required lab responsibilities agreement included in their course syllabi, and have been approved for lab access by their instructor or lab manager***. Once students have completed these requirements for access to the labs, the lab instructors and lab managers will convey to the administrative assistants in each department that information, so that the students' card access permissions can be updated accordingly.

There is a swipe card lock on each of the laboratory doors; ***each person must swipe their card for entry into the labs.***

In case students want to use the lab outside of scheduled class hours, in addition to using the card swipe to access the labs, all students must utilize the Laboratory Access Log present in each lab. Students must enter into the Log, their names, date, and timesof entry and exit.

Training and review of safety procedures will be conducted during the initial class meetings. All safety and operating procedures must be followed at all times.

4.2. Hazard Assessment Process

a. Faculty, staff, and/or students employing the use of powered or manual machinery (e.g. machine tools, band saws, breaks, shears, welding equipment, etc.) in CECS laboratories or shops, student projects, or student club or group activities are required to conduct a formal risk assessment consistent with the CECS template (see Appendix A).

b. Safety concerns for each laboratory or shop will be reviewed in relevant courses at the beginning of the semester before entering the lab and included in course syllabi for reference. In addition, lab safety rules, hazard communication pictograms, and emergency procedures will be posted at the entrance to each lab.

c. All laboratory accidents will be reported to the University and College leader and reviewed for root cause.

4.3. Operating Procedures – Open Laboratory Policy

The College of Engineering and Computer Science maintains an open lab policy. This means students, staff, and faculty can work in the specific lab (Open project lab) during the evenings or on weekends, once they have permission to do so from your instructor or project manager. There is a swipe card lock on each of the laboratory doors; each person must swipe their card in addition to signing the entry log. In order to gain access to the lab, you must first havepermission and safety training given by your lab instructor or lab manager. The training and review of safety procedures will be conducted during your initial class meeting.

Laboratory	Opening time
G102 – Superlab	Open for specific practical classes following the schedule
G205 – Computer lab	Open for specific practical classes following the schedule
G207 – Computer lab	Open for specific practical classes following the schedule

G208 – Mechatronics and Control lab	Open for specific practical classes following the schedule
G209 – FMS&CIM lab	Open for specific practical classes following the schedule
G210 – Communication Network lab	Open for specific practical classes following the schedule
G211 & H104 – Open project lab	Open 24/7 all days of the week for students' practice and self-study. Students must use their student card to access this lab
H102 – Power System Lab	Open for specific practical classes following the schedule
H103 – Material Science lab	Open for specific practical classes following the schedule
H105 – Fluid Mechanics lab	Open for specific practical classes following the schedule
H106 – CAD/CAM lab	Open for specific practical classes following the schedule
H109 – CNC machining center	Open for specific practical classes following the schedule
H110 – Rapid Prototype lab	Open for specific practical classes following the schedule

The following safety and operating procedures must be followed at all times. If this policy is not followed, your open lab privilege will be revoked.

- Use of Engineering and Computer Science facilities is only for CECS students, staff, and faculty, except for Superlab and Computer labs. Superlab and Computer labs can be used by students, staff, and faculty of other colleges who have classes registered to use these labs.
- Anyone working in the lab after normal hours (see lab manager) must follow the specific access requirements identified by the lab manager or instructor.
- There must be a minimum of two persons in the lab at all times, including when work is conducted after hours (short 5-minute breaks are permitted). The last person to leave the lab needs to ensure that all lights, heat sources, and equipment are turned off.
- Do not bring weapons, explosives, or other hazardous articles into the laboratory.
- You will be held responsible for all equipment. Do not let anyone take equipment from the labs.
- Doors may not be propped open at any time. Use your Card for access. If you don’t have access, see the Administrative Assistant of your major department.
- Strangers and unauthorized persons are not allowed to enter the laboratory.
- The college is not responsible for personal items left in the laboratories or classrooms.
- Do not conduct any activity that might be considered dangerous or in violation of any of the university’s acceptable use policies.
- **No food, drinks, or tobacco products are allowed in the labs.**

- Leave the labs neat and orderly.

4.4. Inspection

CECS adopted a policy of periodic yearly inspections (environmental, health, and safety) of all laboratory facilities by the Vice Dean of the College, and by the Safety Officer.

Self-Inspection

The inspection consists of interviews of faculty,staff, and students with access to laboratories and laboratory inspection. The inspection team is responsible for developing questionnaires used in the interviews. The laboratory inspection includes:

- Posted signage of emergency procedure and laboratory policy
- First aid equipment
- Personal protective equipment
- Cleanliness of laboratory and environmental hazards
- Adherence to lab procedures and rules
- Electrical safety
- Working status of fire extinguishers

The internal inspection will take place during the fall semester of each academic year. The findings will be summarized and sent to the Dean and laboratory managers. Any corrective actions should be made within 30 days by the College.

4.5. Discipline Specific Information

4.5.1 Purpose and Scope

The purpose of this laboratory safety manual is to guide students, faculty, and staff to prevent human injury and environmental damage from equipment, procedures, and testing methods used in College of Engineering and Computer Science laboratories.

4.5.2 Emergency Services Personnel Contact Information

Should guidance be required for a safety or environmental issue, please call the appropriate person below.

- Nguyen Ba Ben - Safety Officer : 0972676586 - ben.nb@vinuni.edu.vn
- Pham Van Kiem, Lab Coordinator: 0988379786 - kiem.pv@vinuni.edu.vn
- Truong Tuan Vu, Lab Coordinator: 0376200891 - vu.tt@vinuni.edu.vn
- Campus operation hotline : +84 2471089779/ext:9903

4.5.3 Responsible Laboratory Manager Contact Information

Mr. Truong Tuan Vu is the responsible laboratory coordinator for the Computer Science and Electrical Engineering laboratories. Mr. Pham Van Kiem is the responsible laboratory coordinator for the Mechanical Engineering laboratories. They should be contacted via telephone or email should any of the following occur:

- Student needs to request access after-hours or during weekends/holidays.
- Any time, a potentially hazardous material is required for completion of an experiment or project. If in doubt about the reportable nature of the material, contact the lab manager.
- Any time an accident occurs.
- Any time a project will require laboratory space for more than one day.
- Any time a tool or other piece of equipment not previously used in the laboratory or detailedin this manual is required for completion of an experiment or project.
- Any time tours are expected to take place where non-CECS students or personnel will bepresent in the laboratory.

4.5.4 Responsibilities of the Laboratory Manager

The Laboratory Manager has overall responsibility for implementation and enforcement of safety procedures in the laboratories, including but not limited to:

- Knowing current University policies and procedures as noted in the University Code of Conduct, this Laboratory Safety Manual, and any related documents.
- Laboratory Safety Manual compliance.
- Ensuring that each student, student worker, or collaborating researcher understands how to complete each assigned task safely.
- Ensuring Emergency Action Plans are in place and a first aid kit is available.
- Documenting that the appropriate training has been provided.
- Providing regular safety and housekeeping inspections including inspections of emergency equipment.
- Advising management of the safety needs of subordinates.
- Encouraging each employee to develop safe and healthy work habits.

4.5.5 General regulation

a. Regulations on hair and clothes:

- Wear appropriate personal apparel in the laboratory.
- Wear appropriate protective personal equipment (goggles, mask, gloves) for individual experiments upon request of the Instructor and Teaching Assistants.

b. Regulations on the use of equipment and other facilities:

- Participate in general safety induction training and complete the Safety Induction Form (Appendix E) before any activities in the Laboratory.
- Be aware of safety manuals, equipment manuals, and safety devices that are provided in the laboratory. When using equipment, be certain that you understand how to operate the device safely.

- Use only registered devices. When using the device, it is necessary to register in advance, check the status of the device, and keep a log of using the device. During use, if there is any problem, it is necessary to notify the laboratory manager immediately to fix it, and not to adjust it voluntarily instead.
- Do not conduct any unauthorized experiments or procedures.
- Keep pathways clear by placing extra items (books, bags, mobile phones...) in your locker or cabinet.
- Clean properly and hand over back equipment you have used. Leave your workstation clean and in good order at the end of the laboratory session.
- Do not write or mark directly on plastic/glass labware, equipment, and other laboratory properties. If necessary, use lab tape.
- Do not arbitrarily move, modify, or relocate laboratory equipment, or take it outside the laboratory.
- Report all accidents, injuries, damage to laboratory properties, and potential safety hazards to Instructors or Teaching Assistants immediately. You must pay due compensation for any kind of damage or defect of laboratory properties.

c. Other regulations:

- Be on time. Practices in the laboratory follow the order of specific procedures. You need to be on time to start systematically the experiment with your partners and others in the laboratory.
- Pay full attention and always perform the experiment or work precisely as directed by your Instructor and Teaching Assistants.
- Do not eat, drink, or smoke in the laboratory. Do not bring weapons or explosives into the laboratory. Do not arbitrarily take belongings of the lab and other people.
- Prepare the assigned experiment before you start to work. Pay close attention to any cautions described in the laboratory exercises.
- Report all accidents, injuries, breakage of glassware, equipment, or potential safety hazards to Instructors, or Teaching Assistants immediately.
- Strangers and unauthorized persons are not allowed to enter the laboratory.
- The University is not responsible for items left in the labs.
- If lost items are found, please give them to the lab manager.
- Scheduled class use of the lab has priority over all other uses. If you need to schedule the use of a lab for an activity other than a class, please see the CECS lab manager. Requests for use of the labs must be approved by the Vice Dean.
- Be courteous and respectful of others.
- When witnessing other people violating the laboratory rules, everyone should be

reminded. If the violation is at a serious level, it is necessary to immediately notify the laboratory manager to soon take measures to resolve it.

- Faculty, staff, and students working in the laboratory when having problems with electricity, water, and other incidents must immediately notify the laboratory manager.
- Strictly implementing epidemic prevention measures (wearing masks, measuring temperature, making medical reports ...) when requested by College of Engineering and Computer Science.
- Each person working in the laboratory is responsible for implementing this internal regulation and complying with the management of the laboratory manager.

4.5.6 Cleaning and general housekeeping

- Laboratories should be maintained in a clean and orderly manner.
- Floors should be swept clean at the end of the day or class.
- Equipment/tools should be cleaned after use.
- Report any damage or missing parts of tools/equipment to the supervisor immediately.
- Place storage guards back on tools/equipment after use if applicable.

4.5.7 Machine Guarding

- Equipment or tools that present hazards from their operation, nip points, rotating parts, flying chips, and sparks must be properly guarded.
- Guards should not pose an additional hazard to the worker.
- At no time should a guard be removed or changed in any way.
- Equipment that is missing a guard should be tagged and removed from service. Once thepiece of equipment is properly guarded it may be put back into service.

4.5.8 Training

Users of the laboratories will be trained to perform the following tasks:

- Follow the requirements of this Laboratory Safety Manual, prudent laboratory practices, and other applicable rules.
- Follow oral and written laboratory safety rules, regulations, and standard operating procedures required for the tasks assigned.
- Plan and conduct each operation following safety plans and prudent laboratory practices.
- Review and understand the hazards of materials and processes in the laboratory before conducting work.
- Develop and use good personal hygiene and safety habits.
- Wear all the required personal protective equipment/clothing.
- Keep the work areas safe and uncluttered.

- Promptly report accidents to the laboratory supervisor.
- Complete all required health, safety, and environmental training.

4.5.9 Description of Laboratories

a. Room G102: Super laboratory

Superlab - Room G102 is a multi-purpose laboratory that can be used in many classes with many subjects. Only students who have specific practical classes following the schedule are permitted in this lab.

b. Room G205 & G207: Computer laboratory

Computer laboratory - Room G205 and G207 are used to teach and practice programming subjects using only a computer for CECS students. Only students who have specific practical classes following the schedule are permitted in these labs.

c. Room G208: Mechatronics and Control laboratory

Mechatronics and Control laboratory - Room G208 is used to teach and practice some specific courses for CECS students. Only students who have specific practical classes following the schedule are permitted in this lab.

d. Room G209: FMS&CIM laboratory

FMS&CIM laboratory - Room G209 is used to teach and practice some specific courses for CECS students. Only students who have specific practical classes following the schedule are permitted in this lab.

e. Room G210: Communication Network Laboratory

Communication Network laboratory - Room G210 is used to teach and practice some specific courses for CECS students. Only students who have specific practical classes following the schedule are permitted in this lab.

f. Room G211 & H104: Open project laboratory

Open project laboratory - Room G211 is a laboratory for CECS students working on projects during the learning process. It will be open 24/7 every day of the week for students' practice and self-study. Only students who have been approved by the Laboratory Manager and have signed the Open Laboratory Policy Acknowledgement Form (Appendix B) are permitted in this lab.

g. Room H102: Power System laboratory

Power System laboratory is used to teach and practice some specific courses related to AC Power Transmission System, Hydropower Electricity Generation System, and renewable energy systems (Wind and Solar Hybrid system) for CECS students. Only students who have specific practical classes following the schedule are permitted in this lab.

h. Room H103: Material Science laboratory

Material Science laboratory is used to teach and practice some specific courses for

CECS students related to characterizing the internal structure of materials (tensile, torsion, and compression). Only students who have specific practical classes following the schedule are permitted in this lab.

i. Room H105: Fluid Mechanics laboratory

Fluid Mechanics laboratory is used to teach and practice some Fluid courses for CECS students, consisting of an assortment of apparatus needed for experiments into the properties of fluids and hydrostatics, pneumatics, and hydraulics system. Only students who have specific practical classes following the schedule are permitted in this lab.

j. Room H106: CAD/CAM laboratory

CAD/CAM laboratory is used to teach and practice design, programming, and simulation for CECS students with advanced mechanical software (SolidWork/SolidCam, Ansys, Matlab- Simulink, ADAMs,…). Only students who have specific practical classes following the schedule are permitted in this lab.

k. Room H109: CNC machining center

CNC machining center is used to teach and practice some mechanical courses for CECS students with manual and CNC machines, cutting laser, drilling, Semi-Auto Bandsaws, and press machines,... Only students who have specific practical classes following the schedule are permitted in this lab.

l. Room H110: Rapid Prototype laboratory

Rapid Prototype laboratory is used to teach and practice some specific courses for CECS students to make prototyping samples through 3D printing and scanning machines. Only students who have specific practical classes following the schedule are permitted in this lab.

4.5.10 Acceptable Use Policy for Computers in Labs

- The lab is for academic use only.
- Password sharing and logging in for others is prohibited.
- Music should not be audible to others. If you wish to listen to music, please use headphones or earbuds and keep the volume down.
- No pornography, sexually explicit, or potentially offensive material may be viewed or downloaded.
- Files should be stored on personal media and not on the hard drives of the lab computers. Information on the hard drives is subject to being erased at any time, and in the meantime may be viewed by other students who could possibly plagiarize your work.
- Students will not conduct any illegal activities in the lab (including, but not limited to, illegal sharing of copyrighted materials).
- Students may not install or use peer-to-peer applications in the lab.

- Labs may not be used for hacking activities or any type of unauthorized access.
- Network ports in the computer labs are for lab equipment only.
- Sending/posting harassing or unwanted messages to others is prohibited.
- Be sure to log out from any e-mail accounts or similar systems when you are finished using them.

4.5.11 Description of Physical and Flammable Hazards

Physical hazards are defined in this manual as those with potential risk of injury or death not associated with chemical exposure. Physical hazards in this manual are divided into the sub-categories of electrical hazards, pinch-point hazards, airborne particulate hazards, trip hazards,noise hazards, and high-temperature hazards. Flammable hazards are defined in this manual asthose substances that can catch fire easily, such as petroleum distillates and solvents.

a. Electrical Hazards

In the laboratory, users may be exposed to electrical hazards including electric shock, electrocutions, fire, arc blasts, and explosions. Potential exposures to electrical hazards can result from faulty electrical equipment/instrumentation or wiring, damaged receptacles and connectors, or unsafe work practices.

Electric Shock

Electric shock occurs when the body becomes part of an electrical circuit. Shocks can happenin three ways.

- A person may come in contact with both conductors in a circuit.
- A person may provide a path between an ungrounded conductor and the ground.
- A person may provide a path between the ground and a conducting material that is in contact with an ungrounded conductor.

The extent of injury accompanying electric shock depends on three factors.

- The amount of current conducted through the body.
- The path of the current through the body.
- The length of time a person is subjected to the current. Other factors that may affect the severity of the shock are:
- The voltage of the current.
- The presence of moisture in the environment.
- The phase of the heart cycle when the shock occurs.
- The general health of the person before the shock.

The amount of the current depends on the potential difference and the resistance. The effects of low current on the human body range from a temporary mild tingling sensation

to death. Anelectric shock can injure a person in either or both of the following.

- A severe shock can stop the heart the breathing muscles, or both.
- The heating effects of the current can cause severe burns, especially at points where the electricity enters and leaves the body.

Effects can range from a barely perceptible tingle to severe burns and immediate cardiac arrest. Although the exact injuries that result from any given amperage are not known, the following table demonstrates this general relationship for a 50-cycle, hand-to-foot shock of one second'sduration:

Current level	Probable effect on the human body
1 mA	Perception level. Slight tingling sensation. Still dangerous under certain conditions.
5 mA	Slight shock felt; not painful but disturbing. The average individual can let go.However, strong involuntary reactions to shocks in this range may lead to injuries.
6 – 30 mA	Painful shock, muscular control is lost. This is called the freezing current or"let-go" range.
50 – 150 mA	Extreme pain, respiratory arrest, severe muscular contractions. Individuals cannot let go. Death is possible.
1000 – 4300 mA	Ventricular fibrillation (the rhythmic pumping action of the heart ceases). Muscular contraction and nerve damage occur. Death is most likely.
10,000 mA	Cardiac arrest, severe burns, and probable death.

Wet conditions are common during low-voltage electrocutions. Under dry conditions, humanskin is very resistant. Wet skin dramatically drops the body's resistance.

Fire/smoke

Excessive current flowing through a component can cause smoke or fire hazards. If smoke is detected, immediately turn off the power to the circuit. Locate the problem before applying power to the circuit again. Before applying power to a circuit, double-check the circuit for wiring or design errors. Make sure that the components can handle the designed current.

b. Fire

Fire is the most common serious hazard that one faces in a typical laboratory. While proper procedures and training can minimize the chances of an accidental fire, laboratory personnel should still be prepared to deal with a fire emergency. Small bench-top fires in laboratory spaces are not uncommon. Large laboratory fires are rare. However, the risk of severe injury or death is significant because hazard levels in labs are typically very high. Laboratories, especially those using solvents in any quantity, have the potential for flash fires, explosions, rapid spread of fire, and high toxicity of products of combustion (heat, smoke, and flame).

Laboratory personnel should be trained to do the following to prevent fires:

- Have a written emergency plan for your space and/or operation.
- Minimize material quantities. Have a presence in the immediate work area and use only the minimum quantities necessary for work in progress. Not only does this minimize fire risk, but it also reduces costs and waste.
- Observe proper housekeeping. Keep work areas uncluttered, and clean frequently. Put unneeded materials back in storage promptly. Keep aisles, doors, and access to emergency equipment unobstructed at all times.
- Observe restrictions on equipment.
- Wear proper clothing and personal protective equipment.
- Avoid working alone.
- Store solvents properly in approved flammable liquid storage cabinets.
- Shut the door behind you when evacuating.
- Limit open flames use to under fume hoods and only when constantly attended.
- Keep combustibles away from open flames.
- Remember the "RACE" rule in case of a fire.

  R= Rescue/remove all occupants
  A= Activate the alarm system

  C= Confine the fire by closing doors

  E= Evacuate/Extinguish.

c. Trips, slips and falls

- Laboratory personnel exposure to wet floors or spills and clutter can lead to slips/trips/falls and other possible injuries. To be safe from these hazards, people should keep general environmental controls which state the following: Keep floors clean and dry. In addition to being a slip hazard, continually wet surfaces promote the growth of mold, fungi, and bacteria that can cause infections.
- Provide warning (caution) signs for wet floor areas.
- Where wet processes are used, maintain drainage and provide false floors, platforms, mats, or other dry standing places where practicable, or provide appropriate waterproof footgear.
- The Walking/Working Surfaces standard requires that all people keep the workplace clean and orderly and in a sanitary condition.
- Keep aisles and passageways clear and in good repair, with no obstruction across or in aisles that could create a hazard. Provide floor plugs for equipment, so that power cords need not run across pathways.

- Access to exits must remain clear of obstructions at all times,
- Ensure that spills are reported and cleaned up immediately.
- Eliminate cluttered or obstructed work areas.
- Use prudent housekeeping procedures such as using caution signs, cleaning only one side of a passageway at a time, and providing good lighting for all halls and stairwells to help reduce accidents.
- Instruct workers to use the handrail on stairs, to avoid undue speed, and to maintain an unobstructed view of the stairs ahead of them even if that means requesting help to manage a bulky load.
- Eliminate uneven floor surfaces.
- Promote safe work practices, even in cramped working spaces.
- Avoid awkward positions and use equipment that makes lifting easier.

d. Other Physical Hazards

Pinch-Point hazards

The hazards arise when using power or hand tools in the construction of student projects. Thesafety procedures that are stated using lab equipment apply to the equipment in these laboratories. All saws, drills, and other power tools should be handled with all equipment safety features intact, and all cutting, grinding, etc. will be done away from any electric cords (or otherelectric sources) as well as any water sources.

Airborne Particulates hazards

The primary source of airborne particulates is from cutting and drilling tools, especially if wood is used. Eye protection should be used and windows should be opened.

Noise hazards

Mechanical labs utilize mechanical machines which during operation might produce noise. Under normal operation, no hearing protector is required as the noise producedis below the threshold limits.

High Temperature Hazards

Heat can be the result of using some equipment such as a power tool, 3D printing machine, or laser cutter. Direct physical contact with heat-generating parts should be avoided while it is operating.

Chemical Hazards

No chemical hazards are identified in current CECS laboratories.

5. Roles and Responsibilities

a. Dean

The Dean of the college is directly responsible for the safety of all departments and units under his/her authority.

b. Vice Dean

Vice Dean is responsible for overseeing the implementation of the safety procedures and policies within the department.

c. Faculty member, Principle Investigator, or Laboratory Manager

The individual is responsible for the safety of people working in his or her laboratory. The responsibility includes compliance with the procedures specified in the Laboratory Safety Manual, establishing laboratory-specific operating procedures and policies, and identifying and managing potential future hazards.

d. Students, laboratory personnel, and Visitors

Students and visitors must follow the directions of the faculty or lab manager. Students and laboratory personnel must be trained before obtaining access to laboratories, using equipment, or handling materials. All students, laboratory personnel, and visitors must read and adhere to the laboratory safety rules and procedures specified. If potential hazards are identified, they must be reported to the faculty or the lab manager.