

# ENGINEERING CAPSTONE LABORATORY SAFETY RULES

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An engineering senior capstone project provides hands-on, collaborative learning opportunities applying design, engineering and robotics and to solve a problem. These projects are created in Engineering Capstone Labs located on campus. These learning labs have tools, equipment and processes that may contain hazards that, if not used properly, could cause injury to the student or damage to the tool or equipment. **To insure your safety, are students are required to review and comply with the following safety rules in all labs. Failure of any student to follow established rules related to personal safety, care and use of tools and equipment, or other action deemed inappropriate to can result in limited or revoked access to the lab as determined by the lab instructor or supervisor.**

Refer to your school's policy for shop or lab access for specific hours, equipment training, and PPE requirements.

**IMPORTANT - Never work alone, always use the Buddy System:** There must always be a second person (instructor, assistant or another student) in the lab area with you when working in the lab. **If you are the last person to leave a lab, please be sure to cut off lights and verify all doors are closed and locked.**

## General Shop & Laboratory Safety Rules

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- All students are required to have operational and safety training prior to operating any shop equipment, especially lathes, mills, drills, saws and grinders. **In any lab or shop area, DO NOT turn on or attempt to use any machine tool or other equipment if you have no experience or training using it!** It is the student's responsibility seek out the lab instructor, supervisor, or GA assistant for safety training, proper tool selection, set up and operation assistance.
- Orient yourself so that, in the event of an emergency, you can quickly reach the red emergency off button when operating equipment.
- If you want to observe a machining operation being done by another student, stand only to the rear of the operator. Do not stand behind or reach over equipment that is in motion.
- Verify that all guards and covers are secured and in place before operating equipment.
- Equipment must come to a complete stop before adjustments are made, or bits/blades replaced.
- Keep machine tables and ways clear and clean of excess tools, bits and chips/swarf.
- Notify the lab supervisor of any tool, bit, blade, or equipment that is broken or damaged and needs service or replacement.
- Do not leave empty drink cups, cans or bottles on the workbenches and dispose of all trash before leaving. Please refrain from eating in the labs. Promptly clean up any liquid spills, especially any water or oil that could create a slip hazard. Keep floor areas clear of any hazard that could cause a slip, trip or fall.
- Return all unused stock to storage racks and bins.
- Return all paint cans, solvents, and other flammable liquids to the safety cabinets when not in use.
- No spray painting in labs! All spray painting or any process the emits fumes should be done outside or other well-ventilated area.
- For safety and security, all laboratory doors should be closed and not propped open. **This is especially important for external doors.**
- Lab instructors, supervisors, and GA's have the authority to halt any unsafe operations.
- Horseplay, pranks, or activity outside your class assignment is not permitted.

## Proper attire in shop/lab areas

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Students must dress accordingly when in the lab/shop areas:

- **No loose fitting clothing**, which can become caught in rotating spindles such as lathes and milling machines. **No jackets, coats** or are to be worn when operating machinery. Long sleeve shirts are to be rolled up to elbows. **No crop tops**. If wearing a hoodie, tuck in drawstrings, roll up sleeves, or remove hoodie.
- **All long hair, extensions, braids must be gathered together** and tied behind the head or under a cap to prevent being caught in rotating equipment, such as a lathe or mill.
- **Remove watches, rings, bracelets, wristbands, necklaces or any other jewelry item** that could be caught in rotating machinery. Nothing should be worn from elbow to fingertip. **No fingernail extensions!**
- **No open-toed shoes, such as sandals, flip-flops, slides**, etc. Foot should be completely covered and soles should be hard rubber to reduce slipping on floor. Leather or canvas shoes are recommended.
- **No shorts or skirts**. Long pants required for both men and women in all shop areas to help protect legs against chips and sharp edges.

## Personal Protective Equipment – PPE

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PPE is personal safety equipment that is required to be worn, depending on the lab and the hazards present, as indicated below:

- **Safety glasses** is the most common student PPE and **must be worn in all labs when doing any work such as grinding, machining, drilling or sanding that can generate chips, particles or dust, spray painting, handling liquids such as acids or solvents, using hammers and other striking tools**. Students with prescription glasses must either use safety glasses designed to be worn over glasses or have prescription glasses that have impact-resistant plastic lenses per ANSI Standard Z87.1. Students should purchase their own safety glasses and have them on whenever they are working in the labs. **NOTE: Current COVID protocols require that facemasks be worn in all buildings, including labs, at all times.** If fogging while wearing your safety or prescription glasses with a mask is a problem, rub some shaving cream on both lens surfaces and wipe clean with a dry cloth. A film will remain on the lens and help reduce fogging.
- **Dust Masks** are to be worn when sanding wood, fiberglass, when using a rotary tool such as wire brush to remove paint or rust, or any activity that can generate airborne dust, but are not required due to current COVID protocols requiring facemasks.
- **Hearing Protection:** PPE such as ear plugs or muffs are available when using tools such as grinders or other shop activity that creates high noise levels.
- **Carbon Filter Respirators** are to be worn whenever spray painting, using organic solvents or any activity that generates harmful mists, fumes or vapors.

## Electronic Devices (cell phones, ear buds, headphones, mp3 players)

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- **No cell phones, ear buds, headphones, or other electronic device use** while working in the shop/lab area. Your focus must always be on the work you are doing not be distracted.

## Electrical/Electronics Safety Rules

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- When soldering, avoid breathing vapors. Use a filtering blower and only solder in a well-ventilated area.
- Place hot irons in their holder and be sure to unplug the iron and allow to cool before storing them.
- Pay close attention when wiring a circuit and meter(s) Note: an ammeter must be in series with a resistor or load.
- Have lab partner check circuit and meter connections.
- Verify power is OFF when wiring or rewiring circuits.
- Verify that no body part is in contact with wiring or rotating machine parts before energizing circuit.
- No exposed high-voltage battery leads. Use proper clips and crimped terminals when connecting rather than bare wires

## Housekeeping

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- Keeping a clean, organized work area is required of all students in the lab. **Manage your time to stop 10-15 minutes early to provide time to clean work area/store tools before leaving the area.**
- Machining, woodworking, grinding, spray painting, are just some of the shop processes that can create chips, sawdust or other debris that need to be cleaned up every time you are finished using tool. **Do not leave a dirty work area!**
- Never move metal chips with bare hands. Use a chip brush or shop vac while the machine is NOT operating.
- Do not apply tape to workbenches or floors. Tape on floor can pull up paint.
- Do not use compressed air guns to clear dust or chips from clothing, hair, tools or aim at another person.
- All floors, machine surfaces and bench surfaces could be cleared of any debris before leaving the work area. Oil and grease spills on floors should be immediately wiped up.
- Put tools back on rack or in cabinets where you found them.
- Place scrap aluminum, steel, and swarf/chips in appropriate recycling bins. All dirty rags, paper, and plastic materials should be disposed of in trash containers.
- If you are working on long term team projects like EVP and Mechatronics, pick a day each week (Fridays are good) to tidy up your work area, clean and sweep, clear trash, organize tools, etc.

## Medical situations and what to do next

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- **Medical Emergency or Injury: Call 911. Cell phone calls will be directed to the City Police Dispatch.** If an injury occurs, either minor or major, to you or a fellow student, seek immediate assistance from the lab instructor, GA or front office personnel on duty. If injury is serious or other medical emergency occurs after hours or weekends, **call Campus Police and be prepared to provide building and laboratory number/location to direct responders to your area.** Note: If injury occurs when operating machinery, turn off equipment if still running.
- **Minor cuts/scrapes:** Clean the area thoroughly with soap and water and alert the instructor. All lab areas should have a first aid kit available with wound care/bandage supplies.
- For non-emergency assistance (auto issues, security escort, etc.) call **Campus Police.**

## **Other Campus Safety Situations/Precautions**

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**Tornado/Severe Weather:** The campus emergency siren will activate if there is a tornado warning for the area. Shelter in place and take cover under heavy furniture of an interior hallway. Follow the instructions of emergency response personnel or remain in shelter area until given the all clear. **NOTE:** The campus emergency siren is tested once per month classes are in session. There will be prior notifications when these tests will be conducted.

**Fire or Fire Alarm: If the fire alarm sounds, evacuate the building through the nearest exit. Exits are at the end of hallways you entered.** Orient yourself to the location of fire alarms, fire extinguishers and the proper route out of the area in the event of an emergency. If fire is small and can be easily put out, dry chemical extinguishers are located at exit points for flammable materials (trash, wood, paper), flammable liquid and electrical equipment fires.

**Active shooter in your vicinity:** Quickly determine the most reasonable way to protect your own life. Recommended responses, dependent on shooter location and situation are: 1. Evacuate/run, 2. hide in place, 3. confront/engage shooter. For more detailed information and recommended actions for students to deal with this emergency, go to your school's alerts webpage.

After hours lab use (evenings after 4:30, weekends): All students are required to use the buddy system if working after hours and weekends. Students can contact Campus Police at to request a security escort to their car.