

LAFAYETTE

MECHANICAL ENGINEERING

DEPARTMENT SAFETY RULES AND PROCEDURES

1. Working Hours

- 1.1. Work is primarily performed in the student machine shop under the direct supervision of a technician or faculty advisor weekdays between 8 am- 3:45 pm. 3:45pm -4:00pm is reserved for cleanup. In *special cases* the students can work in the shop at other times under the direct supervision of a technician or faculty advisor.
- 1.2. Work can be performed by students in project rooms between 6 am – 12 am. Outside of weekday operating hours (8 am- 4pm) *at least 2* students must be in the project area where the work is being performed.

2. Impairment

- 2.1. Students may not work, or be in the machine shop/project rooms while others work, when impaired. Impairment includes: being under the influence of alcohol or drugs (including prescription or over-the-counter medication), exhaustion, sleep deprivation or any other condition that adversely affects one's judgment.

3. Student Machine Shop

- 3.1. Students will consult with technicians about the manufacturability of designed parts. Dimensioned drawings must be submitted to the supervising technician. In most cases the machine shop staff will complete fabrication after the consultation process.
- 3.2. Students participating in department approved projects are permitted to work in the machine shop if they have the authorization of the supervising technician in the shop (staff or faculty member) and follow the following basic rules:
 - Safety glasses must be worn at all times
 - Long pants are required to prevent burns from hot chips
 - Remove loose fitting clothing, jewelry, and tie back long hair
 - Closed toe footwear is required (no sandals or flip-flops)
- 3.3. A dimensioned drawing that meets the standard set forth in ME210 is *required* before you can begin a machining operation
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3.5. The number of students that can be supervised at any one time is based on the *supervising technician's assessment* of the:

- student's proficiency with the equipment
- complexity of the operation
- overall level of activity in the shop

The supervising technician's assessment is final.

3.6. Students are required to leave their cellphones outside of the machine shop.

4. Standard Operating Procedures

When using hand held tools the standard operating procedures listed below **MUST** be followed. **Students cannot use the equipment listed below until they have reviewed the procedures with a supervising technician (faculty advisor or shop personnel).** The list of authorized students must be posted in the work area. Note that welding requires special training and demonstration of proficiency in order for students to use the welder without direct supervision.

4.1. General Procedures

Regardless of the requirements for safe entry into a working area:

- **Safety glasses must be worn by everyone in a work area where fixed or hand held tools are being used**
- **Ensure the work area is clean** and the activity level in the work space will not distract you from the operation
- **If you have a cell phone, secure it in the storage locker before you begin any of the operations listed below.**
- Music can be played in work spaces, but the volume must be low enough that it does not impede verbal communication at normal speaking volume. For your safety, this rule is in effect at all times.
- Headphones are not permitted in the project areas without authorization.
- Remove loose fitting clothing, jewelry, and tie back long hair.
- Long pants are required wherever machining operations are performed to reduce injury from hot chips or flying debris

4.2. Hand Drills

- Remove loose fitting clothing, jewelry, and tie back long hair
- Loose *parts must be clamped* to the work surface. Do not hold with your hand
- Turn off and unplug before inspecting or changing bits.
- Ensure the drill bit is free from burs and not obviously dull.
- NEVER start the drill with the bit in contact with the material.
- Adjust drill speed for the material (slower for hard - faster for soft). Begin slowly if uncertain and increase speed cautiously
- Use firm pressure, but **DO NOT FORCE THE BIT** into the material by straining.
- Allow the drill bit to stop completely before setting down or changing tool

4.3. Hand Held Grinders

- Remove loose fitting clothing, jewelry, and tie back long hair

- Loose *parts must be clamped* to the work surface. Do not hold with your hands.
- **FACE SHIELDS ARE REQUIRED** for grinding operations
- Remove flammable materials from the immediate area
- Turn off and unplug before inspecting or changing wheels.
- ENSURE the correct guard is in place for the operation. Cut-off operations require different guards than grinding wheels.
- Check abrasive wheel for cracks or flaws and REPLACE if any are found.
- Verify the RPM rating of the wheel matches the max RPM of the grinder.
- NEVER start the grinder with the wheel in contact with the material.
- Allow the grinder to stop completely before setting down.
- DO NOT use the work piece to brake or stop the wheel.
- Parts and wheel can be HOT. Wait to cool or use gloves.

4.4. Dremel Tools

- Remove loose fitting clothing, jewelry, and tie back long hair
- Loose *parts must be clamped* to the work surface. Do not hold with your hands.
- **Use a dusk mask** for plastics, wood and other materials that produce fine particulates.
- Turn off and unplug before inspecting or changing tools.
- Check abrasive wheel for cracks or flaws and REPLACE if any are found.
- Verify the RPM rating of the wheel matches the max RPM of the tool.
- Ensure the drill bit is free from burs and not obviously dull.
- NEVER start the tool when the bit is engaged in the material
- Allow the Dremel to stop completely before setting down.
- DO NOT use the work piece to brake or stop the tool.
- Parts and tool can be HOT. Wait to cool or use gloves.

4.5. Fixed Grinder

- Inspect grinding wheel for cracks before using. Do not use if ANY cracks are detected.
- **FACE SHIELDS ARE REQUIRED** for grinding operations
- Remove loose fitting clothing, jewelry, and tie back long hair

4.6. Soldering Iron

- The heated tip of the iron will cause instantaneous and severe burns to your skin and can ignite surrounding materials. Be conscious at all times of the location of the tip.
- Remove any materials from the work-space that are easily ignited such as paper or cardboard.
- Use only lead-free solder.
- Be careful to NOT inhale the vapors from the solder, wires or insulation.
- Use a wet sponge to keep the tip clean.
- Always return the iron to its stand when not in use. Even when cold.
- Turn off the soldering iron before you leave the workspace.
- **Wash your hands with soap and water after soldering.**

4.7. Welding

Students are required to *be trained and certified* by a supervising technician (faculty or shop personnel) in order to use the welder unsupervised.

- Ensure the work area is dry, clean and free of grease, oil or any flammable materials.
- Inspect the gloves and ensure they are dry and free from holes.
- Inspect the electrode holder or gun is in good condition.
- Turn on fume extraction hood before beginning and make sure air is flowing.

- Welding curtains **MUST** be used to protect everyone within line of site of the welding operation
- Set the machine to the proper current and voltage based on the training provided.
- A welding helmet with proper lens filter must be used by *all students* in the welding area. **Safety glasses must be worn UNDER the welding helmet by all students in the welding area**
- Welding gloves and jacket **MUST** be used by all students in the welding area
- When finished switch off the machine and fume extraction fan.

4.8. Utility/X-Acto Knives

- Cut resistant gloves are recommended and will be made available.
- Inspect the blade to make sure it is not dull, nicked, cracked or rusty. If needed, replace before using the tool.
- Place the material to be cut on a flat stable surface. Use a vice where conditions allow.
- For extendable blades, do not extend more than is necessary.
- Do not cut in the direction of your hand or body. Pull the blade to either side of you and not directly toward you.
- For thick material, use several shallow cuts to reduce the chance of a slip or jump.
- Do not strain to force the blade through the material. Never use a hammer to force a blade into the material.
- *Immediately* store the cutter when the task is completed. For retractable blades, make sure they are retracted before they are stored.

5. Hazardous materials (paint, solvents, oil, etc.)

5.1. Material Safety Data Sheets (MSDS)

- MSDS should be kept in the area where the hazardous materials are used.

5.2. Disposal

- NEVER dispose of hazardous substances or chemicals in the sink .
- Hazardous materials must be disposed of in accordance Lafayette's Chemical Hygiene Plan as well as local, state and federal regulations. Contact Tom DeFazio, Coordinator of Chemical and Environmental Engineering Laboratories for proper disposal.

6. Electrical Equipment

6. Students will not energize electrical components they built or modified that operate above 24V without approval from the faculty advisor or a shop technician.

7. Prototype Testing

7.1. Testing of any prototypes requires a written testing plan and risk assessment be completed and documented by the students and approved by the faculty advisor in advance of the test. A suggested method to assess and document the risks is available on the department website.

7.2. Prototype testing is restricted to the hours of 6 am to 12 am.

7.3. Testing of pressure vessels should never be performed with compressible gas. Pressure tests must be performed with a non-toxic pressurized liquid under the direct supervision of a shop technician or faculty advisor to prevent explosive decompression.

8. Incidents

8.1. In the event of an emergency call public safety immediately by dialing 4444 (610-330-4444 from a cell phone) and be prepared to give the following information:

- Building name
- Room number
- Type of emergency (e.g. fire, injury, chemical release)

Emergencies include, but are not limited to:

- Deep lacerations
- Loss of consciousness (for any reason)
- Sickness from fumes (from known or unknown sources)
- Electrocution (even if the person remains conscious)
- Accidental ingestion (even without symptoms)
- Eye injuries such as impact to the eye (even without symptoms)
- Chemical burns

8.2. Incident Reporting

- As soon as possible after an incident has occurred, students involved must report the incident to their faculty advisor. The faculty advisor will report the incident to the head of the department.