

# Machine Intelligence Lab (MIL)

## Lab Safety and Information

(Last updated on 1-Mar-16)

### Cleanliness/Respect:

Student *Cleanliness/Respect* is a subjective assessment of the students' overall attitude in the MIL laboratory. The cleanliness portion of the category refers to the effort each student puts forth to clean up the machines and work area that she/he uses. It is **NOT** the laboratory director and student leaders' (henceforth refer to by MIL staff) job to clean up after the students but rather to instruct them in proper and safe use of the equipment and design methods. The respect portion of this category is used to judge the amount of care the students take when using each piece of equipment and when listening to the laboratory staff. **Arrogant or obstinate behavior has no place in the laboratory and will not be tolerated.** Students who fail to listen to MIL staff instructions will be removed from the lab.

### General Safety:

The following rules apply to everyone working in the MIL (UF's MEAC 126, Building 183, 571 Gale Lemerand Drive). They are intended to provide guidelines to working safely in the lab as well as familiarize you with some of the common hazards.

- **Familiarize yourself with the layout of the laboratory.** Note the location and operation of the exits, first aid kit, and eye wash station.
- **Get checked out by MIL staff the first time you use each machine or process in the lab. Do not operate any machinery with which you are unfamiliar.** Every tool in the lab has safe operating procedures. Do not work with any tool in the lab until MIL staff has introduced you to its safe operation. Please get checked out even on tools that you have used elsewhere previously. The MIL staff knows the idiosyncrasies of our tool set. We would like the opportunity to pass this knowledge on to you. Also, our procedures may require more care than you are used to applying. Only by communicating with you can we exchange information about the safe use of our tools.
- **Wear all necessary protective gear and clothing when working anywhere near machines.**
  - **Always wear safety glasses, regardless of what you are working on.** Eye hazards always exist and you must always protect your eyes from them.
  - **Always wear shoes that completely enclose your feet: no sandals, flip-flops, etc.**
  - **Remove all personal accessories and loose clothing that might get caught in moving machinery.** This includes rings, watches, jewelry, personal stereos, lab rags, ties, and open jackets. Anything that hangs loosely from your body can get caught in rotating machinery. *Loose garments must not be worn in the lab.* Tuck in loose fitting shirts and sweat pants ties. Roll up or remove loose sleeves (wear short sleeves whenever possible). Keep tight fitting jackets closed. Do not keep rags in your pockets. Do not wear headphones while working with lab machines.
  - **Long hair must be securely tied up.** Most of the power tools in the lab make use of a rotating shaft. Long, loose hair can get caught on the rotating shaft and pull the owner's head into the spindle/tool. Long hair must be kept out of harm's way by tying it up.
  - **Never work alone or without an instructor present.** When working in the lab you must have a second person present who is capable of assisting in the event of an accident. That second person must be able to see you while you are working, and get to you if you need help. If the second person moves to a place where they can no longer maintain visual contact with you, you must cease working. For emergency assistance dial 911 on a cell phone or 9-911 on a campus phone.
  - **Never work when impaired.** This includes times when you are tired, stressed, or otherwise inhibited from exercising appropriate caution in the lab. Do not enter the lab when you are under the influence of any intoxicants or medications that might make you drowsy or alter your ability to be alert. Do not use the lab when you are too frantic to think clearly and carefully. Try to avoid last minute lab work in favor of a consistent weekly effort. Deadline-driven haste can lead to ruined projects and serious injuries.

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- **Never leave a machine running unattended (for even the shortest amount of time).** You must keep your attention focused on the machining operation. If you are focused on the process, you will be more likely to react appropriately in the event of a problem.
- **Keep your hands well away from the point of contact between the work piece and the cutter.**
  - **Keep all parts of yourself at least 6 inches from the point of contact between any work piece and any cutter.**
  - **Take careful notice of the exact position and size of the work piece and cutting tool before turning the machine on, as once in motion the true size is deceptive.**
  - When using the drill press, especially with large drills and tough to cut materials, you must clamp the work to the drill press table. If the drill catches an unclamped work piece, the rotating part can severely lacerate your hand.
  - On the band saw, scroll saw, and any other tool that are designed to be used with a hand fed work piece, be certain to keep your hands, fingers, and other body parts out of the path of cutters and away from the point of contact between the work piece and the cutter.
- **No horsing around or practical jokes will be tolerated in the laboratory.** One momentary distraction or surprise can result in a severe accident. What might be funny somewhere else could startle someone in the lab and cause them to seriously injure themselves and/or others. So please act with maturity any time you are working in the lab.

## Clean Up Procedures:

Systematic clean-up is part of the safe operation of the laboratory. If someone cannot find a needed tool in its regular place or if she/he is required to work in someone else's mess, the result will be frustration. It is difficult to keep safety in mind when you are frustrated. So it is important, especially in times of heavy use, to keep the lab clean with everything returned to the correct location at the end of its use.

**Do not let your guard down when you are cleaning up.** Many of the accidents which occur in machine lab environments occur during clean up. So please continue to be vigilant. Carefully cleaning a machine or area that you are unfamiliar with can increase your knowledge of where things are and how things work in the laboratory.

1. **Shut off power to the machine.** Turn off the main power switch for the machine.
2. **Un-mount all cutters and tooling.** Many people cut themselves trying to clean up around mounted cutting tools. Remove all drill bits and similar tools from their tool holders and put them away in their proper storage locations.
3. **Put away all measuring tools, hand tools, material scraps, and drawings.** Put away all items that do not belong permanently with the machine. If you do not know the correct location of an item, ask MIL staff. If she/he does not know, leave whatever it is in plain sight on a table. It is better to leave it out than to put it away in the wrong place.
4. **Clean up shavings and dust.** Use the lab's vacuum to clean up any mess left over from your work. You should clean the equipment well enough that the next user will not be able to tell what material you were working with. *The machine should always be left cleaner than when you began working on it.*
5. **Report missing or broken tools to the MIL staff.** Almost everything in the laboratory can be repaired or replaced, but we need to know about problems in order to correct them. The MIL staff would much rather find out about a broken or missing tool shortly after it breaks rather than when it is needed and not available. Unless the cause was intentional disrespect for a piece of equipment or MIL staff instruction, **you will never be reprimanded for breaking any tooling, so please don't**

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hesitate to inform MIL staff so we can replace or repair the necessary tooling in a timely manner.

6. **Clean up your personal (or group) work area.** Put all the tools away in their proper locations, clean the top of your work area. The floor and surrounding area around your work area should be left as clean as the rest of the lab.

## Emergency Response Procedures

As stated previously, this handout is intended to acquaint new students with common lab hazards. However, **despite our best intentions, the occasional accident is going to happen.** The purpose of this section is to outline common emergency response procedures in the event of an accident.

### Accident Response Levels:

1. **MIL regulars:** for **minor cuts** (not requiring stitches), **abrasions or burns**
2. **INFIRMARY:** for **more serious, yet non-severe injuries** (like cuts requiring stitches)
3. **EMERGENCY ROOM:** for **serious injuries** (like deep lacerations that will not clot)

### Infirmary Information:

- Location: Infirmary Building, 280 Fletcher Drive (east of the Florida Gym and south of the Student Recreation and Fitness Center)
- Hours of Operation: FALL/SPRING: M-F 8-5 pm; Sunday 12-4 pm
- SUMMER: M-F 8-4:30 pm
- Phone Number: (352) 392-1161

### Accident Response Protocols:

1. In the event of an injury:
  - a) Try to remain calm.
  - b) Alert MIL staff or other MIL member(s) in the area so they can help after putting on gloves.
  - c) If the injury does not prevent you from moving, walk to the bathroom with assistance. Never walk alone, as it is common to become dizzy and faint, which can cause an even worse injury.
  - d) If you cannot walk, sit in a chair and let others help you.
  - e) If the injury is minor to moderate, allow a MIL staff or other MIL member(s) to help you and escort you to the Infirmary
  - f) If the injury is serious or severe, call for emergency medical assistance (i.e., paramedics and an ambulance by dialing 911 with a cell phone or 9-911 with a campus phone).
2. The first aid kit is located by the entrance to the lab. Use any items necessary from the kits, but please let MIL staff know if the first aid kit runs low on consumables. The first aid kit contain the following items for dealing with accidental injuries:

a) Nitrile gloves	d) Gauze pads	g) Tourniquet
b) Bandages/band-aids	e) Medical tape	h) Scissors
c) Antiseptic	f) Burn gel	
3. Cuts and Abrasions:
  - a) Always wear gloves when offering medical assistance to another person.
  - b) Firmly cover the area of the wound with a paper towel to assist in clotting.
  - c) Gently, yet firmly blot the area after spraying antiseptic on a clean paper towel.
  - d) Cover small cuts with an appropriately sized bandage or band-aid.
  - e) Cover larger cuts with gauze and medical tape. Apply blood clotting spray to the gauze before covering the wound and securing with the medical tape.
  - f) Monitor the wound closely over the next 48 hours to ensure it remains clean and does not become infected. A follow-up visit to the student health care center is always a good idea.

4. Burns:
  - a) Apply cool water to the area of the burn.
  - b) Gently blot the area after spraying antiseptic on a clean paper towel.
  - c) Gently apply burn gel to the area, but don't cover the wound so it can remain cool.
  - d) Seek immediate professional medical attention for serious burns.
  - e) Seek professional medical attention if you notice signs of infection, like increased pain, redness, swelling, fever or oozing.
5. Foreign debris in eye(s):
  - a) The eyewash station is located in MAEC 124. We hope to get one in the hallway soon.
  - b) Remove contact lenses.
  - c) If you need to use the eyewash station, flush your eyes for at least 15 minutes to ensure the foreign substance is removed from your eye.
  - d) When rinsing, forcibly hold eye open to ensure effective rinsing behind eyelids. Move eye side-to-side and up-down during rinsing to allow the water to carry the foreign debris out of the eye.
  - e) When done, blot your eye lightly with a paper towel, but never rub your eye to dry it (in case there's still anything still inside).

## **Bandsaw Safety**

1. **Always wear safety glasses** when operating the band saw.
2. **Never wear gloves** as they could get caught on the moving teeth and pull your hands into the moving blade, causing a severe injury.
3. **The upper guide and guard should be set to within 1/4 inch of the work piece.** Adjust the guard with the machine turned off.
4. Use a push block for small work so if your hand slips off it will not swing into the blade.
5. Do not push the work piece into the blade hard enough to cause the machine to chatter; slow down and find a more rigid manner in which to support/clamp the work in the saw.
6. **Never cut materials that might be hardened, such as tool steel, files, hardened guideways, stainless steel, etc.** Any material that cannot be cut easily with a standard hand file should never be cut in a band saw.
7. If the band breaks, immediately shut off the power and stand clear until the machine has stopped. Promptly inform the MIL staff so a replacement blade can be installed.

## **Drill Press and Hand Drill Safety (General)**

1. **Always wear safety glasses** when operating the drill press.
2. **Always remove the drill chuck key from the spindle immediately after tightening/loosening.**
3. **Never leave the chuck key engaged in the key chuck.**
4. **Hand drills should be chucked and un-chucked with the power cord unplugged** to prevent accidentally turning on the drill motor, which could break your wrist.

## **Drilling:**

1. **NEVER place tapered shank tools in drill chucks. Only straight shank tools such as standard drill bits can be clamped properly in drill press chucks. Never touch the drill bit or chuck when the machine is in motion.**
2. **NEVER attempt to slow the spindle down with your hand after turning off the power.** Let the spindle stop on its own to avoid lacerations from sharp burrs on the drill chuck.
3. **Run drills at an appropriate speed for the diameter of drill bit and material used.** Larger drill bits require slower speeds. Consult MIL staff for the correct speed if unsure. A high pitch squealing noise indicates the speed needs to be lowered immediately.

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4. **Don't use excessive force when drilling;** let the drill bit do the work. If unsure about what “excessive” means for a particular material/drill bit combination, ask MIL staff. If excessive force is required, the drill bit may be damaged or not the correct tool for the chosen task.
5. **Reduce the drilling pressure as the drill bit breaks through the bottom of the material.**
6. **If the drill binds in a hole, stop the machine and turn the spindle backwards by hand to release the bit. Consult MIL staff before proceeding.**

## Soldering

1. As with all mechanical machinery, **wear eye protection when soldering.** Solder can “spit.”
2. **Never touch the element or tip of a soldering iron; it is very hot (about 400°C) and will burn.**
3. Hold wires to be heated with **tweezers or clamps.**
4. **Keep the cleaning sponge wet during use.**
5. **Always return the soldering iron to its stand when not in use. Never put it down on your workbench.**
6. Re-tin the iron before turning off the soldering iron. Failure to do so will cause the tip to wear out sooner than it should.
7. **Turn unit off or unplug it when not in use.**

## Caliper use and Safety

1. Always treat the calipers gently, as **they are very fragile.** If misused, they will not measure correctly and your part will not be the proper size. *Translation: abuse of the calipers means you will be wasting time making another part.*
2. The calipers are only to be used as a precision measuring device. **They are not to be used as clamps, scribes, wrenches, punches, weapons of mass destruction, etc.**
3. **Be careful not to drop the calipers,** as doing so will ruin their calibration and precision.
4. **Open and close the calipers slowly** with one hand to reduce the wear on the rack & pinion gears inside the caliper body. Rapidly adjusting the calipers will quickly destroy them.
5. **Always wipe the caliper jaws off** before use.
6. **Always ensure the calipers are zeroed** before making a measurement.
7. **Always measure the part twice** to ensure repeatability of the measurement.
8. **NEVER measure a part on the machine while the spindle is running.** Always turn the machine off first and wait for the workpiece or tool to come to a complete stop before performing a measurement.

## Lab Information and Contacts

The main MIL room is MAEC 126. Associated rooms are MAEC 121 (referred to as the MIL Library) and, when the present people move out, we will have MAEC 127 for the MIL student leaders.

MIL phone number: 352-392-6605

MIL mailing address: MAEC 126, Building 183, 571 Gale Lemerand Drive, Gainesville, FL 32611-2049

MIL location on Google maps: <http://tinyurl.com/MIL-lat-long>

Coordinates: 29.64725,-82.349550 (29°38'50.1"N 82°20'58.4"W)

MIL director: Dr. Eric M. Schwartz, MAEC 106, 352-392-2541, [ems@ufl.edu](mailto:ems@ufl.edu)

MIL Student Leader: Andy Gray, [andygrayia@gmail.com](mailto:andygrayia@gmail.com)