

UCSB Physics Graduate Student Shop Handbook

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Shop Safety

It is very important to the Physics Department that the student shop be used in a safe manner. All persons who want to use the student shop are required to read and follow the general safety rules and guidelines listed below. Any student that violates the shop rules may be barred from using the student shop until approval from the shop committee for re-admittance.

Safety starts with you. Most accidents happen because of carelessness or by not following safety rules. Following basic safety rules and using common sense can make the machine shop a safe and enjoyable experience. Think things out first before you get started, make sure your setups are sound. If you are not sure how to do something, ask the shop supervisor. Trying to figure something out on your own may result in damage to the machine or injury to you or others around you. If you break or damage any tools or equipment you must report it to the shop supervisor so that it can be repaired or replaced.

Take the time to familiarize yourself with where everything is in the shop. You should know where the exits are, where the first aid kit is located, where the emergency shut-off switch is located, where the emergency phone is located and where all five fire extinguishers are located.

For liability reasons no one is allowed to train students how to use the machines except for the shop supervisor. The shop supervisor is in the shop to help everyone with any questions or problems. However, he can't be everywhere at once so please be patient until he can get to you. **Do not ask other students for help.**

Student Shop Safety Rules and Guidelines

1. Wear the proper protective gear and clothing.

- Safety glasses are required in the shop at all times. Even if you are not doing anything, someone else can cause chips, sparks or particles to fly into your face. Safety glasses are available for all shop users. Face shields should be worn when any grinding is performed that causes a lot sparks or particles to be thrown.

- Shoes must be worn the shop. No person wearing sandals or open toe and/or open heel shoes will be allowed to enter the shop.
 - If hearing protection is needed due to excessive noise in the shop, hearing protectors (ear muffs) are available for all shop users. Ear plugs can be bought in the main machine shop or the Physics Storeroom.
- 2. Do not wear any loose clothing, jewelry (including rings, watches, necklaces, etc.), personal stereos, gloves or ties around any moving or rotating machinery.**
- Any of these items including long hair can get caught and pull you into the machine. Long sleeves should be rolled up and long hair should be put up or tied back.
 - Shop coats are available for all shop users to use to cover loose clothing and to keep your clothes clean.
- 3. There must be at least one other person in the shop while you are working.**
- Never work alone. Always have another person in the shop with you that can help with first aid or use the phone to call for help if any accidents should happen.
 - Report any injury to the shop supervisor. Do not attempt to remove any foreign objects from the eyes, go to Student Health Services for medical treatment. If chemicals get in the eyes, wash for 15 minutes with an open flow of water before going for medical treatment. The emergency wash station is located to the left of the sink. The emergency phone is located next to the chalkboard and is clearly marked. Also, the campus emergency phone number is 9-911.
- 4. Do not work in the shop if you are tired, fatigued, in a hurry or have had any alcoholic beverages or prescription medicines that may make you drowsy.**
- Most accidents happen because you are in a hurry and are trying to rush through a part. Also, it is not good for the tools and/or machines to rush through a part. If you take your time and work in a calm, timely manner, you will produce better looking parts with less chances of scraping out your parts or putting excessive wear on the tooling. Some accidents happen because someone is tired and/or not alert, please wait until a better time to do your work.
- 5. Nobody is allowed to train students how to use the machines in the shop except for the shop supervisor.**
- For liability reasons it is best to leave the training to the shop supervisor. Also, it is in the best interest of the student to get more comprehensive training where certain situations and safety issues can be pointed out.
- 6. Do not operate any machine unless you are familiar with its operation and have been authorized to operate it. If you have any questions regarding the use of any machine in the shop ask the shop supervisor.**

- Before starting, think the part through. Don't hesitate to ask for advice on what order of operations should be carried out to complete the project.
- Always check your setups to make sure they are sound, don't take chances. Check to make sure there are no clearance problems.
- In the mill, always look underneath your part to make sure you are not going to drill or mill into the parallels. Slide the parallels out if there is a clearance problem.
- Keep fingers clear of the point of operation of machines by using special tools or devices such as push sticks, hooks, pliers, etc.
- Never leave a chuck key in the drill or lathe chuck, or the drawbar wrench on the draw bar. When a tool is tightened, the chuck key or drawbar wrench should be removed immediately.
- Never use a rag near any machine that is running to wipe or clear away chips. Rags can get caught and pull your hand into the machine.
- Never walk away from a machine and leave it running, even for "a quick minute".
- Never wear gloves while using any machine, they can get caught and pull your hand into the machine.
- Do not sit on a chair or stool while using the mills or lathes.
- A hard hammer should not be used to strike a hardened tool or any machine part. Use a soft-faced hammer.

7. Any breakage of or problems with any tool bit or machine/equipment must be reported to the shop supervisor so the tool can be fixed or replaced.

8. Always keep the calipers closed up in the case when not in use.

- If the calipers are not in your hand they are not in use. Put them in the case and close it tight, this will keep them protected and prevent them from getting dirty with chips. If they fall off a machine and land on the floor, they will be protected from getting ruined if they are in the case. Always clean your hands before you use the calipers. If chips get into the tract from your hands (or the machine), it will greatly compromise the accuracy of the calipers or make them completely useless.

9. Everyone is required to clean all machines used and make sure all tools are put back where they belong.

- To clean the machines, first brush the chips off with a brush, then, carefully blow the remaining chips off with the air hose and wipe all surfaces with a rag. All machines must be turned off when cleaning.

- If a lot of long stringy chips accumulate on the machine, a hook tool or pliers should be used to pull the chips off. Gloves should always be worn when cleaning machines, long chips are very sharp and will cut your hands. Gloves for cleaning are available in the shop.
- Never use compressed air to blow chips or dirt off your clothing or hair, or at another person. Small chips or particles can get lodged in the eye and cause serious injury.
- Keep the floor around machines clean, dry and free of any trip hazards. Do not allow piles of chips to accumulate.
- Food/snacks and drinks are not allowed in the shop.

10. Shop coats, safety glasses and rags are not allowed out of the shop.

11. All borrowed items must be signed out on the sign-out sheet and returned within 24 hours. They also must be signed back in so we know that they have been returned.

12. Don't rush or take chances.

Graduate students who wish to use the shop after hours must take the shop course for proper training. Or, if a student has used the shop often enough and show that he/she can use all of the machines with reasonable proficiency, they will be given permission to use the shop after hours. After hour use is intended for emergencies or quick fixes only. Projects should not be planned to be started after hours, the shop is open during the day for this.

Student Machine Shop Hours

The Student Machine Shop hours are from 8:00 to 12:00 and 12:45 to 4:45. The shop is closed from 12:00 to 12:45 for lunch. After-hour use is not allowed after 10:00pm.

DRILL PRESS SAFETY RULES

1. Always wear eye protection.
2. If you've never used this machine before, ask for assistance first.
3. Make sure the drill is tight and remove the chuck key immediately. Never leave the chuck key in the drill chuck.
4. Never hold parts in your hands, clamp them to the table or use a vise.
5. Always use the right speed for the diameter of drill and material being drilled. The drill press must be running to adjust the speed.
6. Always peck drill to prevent long chips from building up on the drill.
7. Brass, acrylic and other brittle materials are difficult to drill, use the right drill bit for the material to be drilled.
8. Use a sheet metal drill for material that is less than 1/8" thick.
9. Ease up on drilling pressure as the drill starts to break through the bottom of the material.
10. Use a brush or rag to brush chips off, never use your hands.
11. Never use a rag to brush chips off while the machine is running.
12. If the drill binds in the hole, stop the machine and turn the spindle backwards by hand to release the bit.
13. Let the drill press stop on its own after turning it off. Never stop the spindle with your hand.
14. Never use too much pressure when drilling. The drill may be dull if you have to push hard.
15. Always center drill first before drilling any hole.
16. Clean all drills with a rag and put them in the right place when finished. Always clean the drill press when finished, never clean a machine while it is running.

BAND SAW SAFETY RULES

1. Always wear eye protection.
2. If you've never used this machine before, ask for assistance first.
3. Always make sure the proper pitch blade is on for the thickness of material that is being cut. There should be at least three teeth in the material.
4. When installing a new blade, make sure the teeth are pointing down on the right side of the blade.
5. Always use the right speed for the type and thickness of material that is being cut. The band saw must be running to adjust the speed.
6. The upper guide and guard should be set to within $\frac{1}{4}$ inch of the material.
7. If the blade breaks, immediately turn off the machine and stand back until the machine comes to a stop.
8. Never cut round stock by holding it in your hands. Clamp the part with a vise to prevent the blade from grabbing the part and spinning it out of your hands.
9. Never push on the stock with your hands directly in line with blade, keep your hands to left and right of the blade. Another method is to use a piece of wood to push the stock through the blade to keep your hands and fingers away from the blade.
10. Small parts should be held with a vise to prevent your fingers from coming too close to the blade.
11. Sometimes parts become too hot to hold when cutting. Parts can be held in a vise or run under cold water and blown off with the air hose to cool them down. Never hold a part with a rag while cutting it.
12. Never use a rag to brush chips off the saw while it is running.
13. Always clean the machine when finished, make sure everything is put away and the light is turned off.

LATHE SAFETY RULES

1. Always wear eye protection.
2. If you've never used this machine before, ask for assistance first.
3. Make sure your part is tight in the chuck and remove the chuck key immediately. The chuck key should never leave your hand. Never leave the chuck key in the chuck.
4. Make sure the lathe is running at the right speed. Some lathes need to be stopped while setting the speed and others need to be running. Make sure you know which lathe you are using, ask for assistance if you are not sure.
5. Move the tool bit a safe distance away from the chuck or collet when inserting or removing work.
6. Turn the chuck by hand to check for any clearance problems before turning on the machine.
7. To turn the lathe on, bring the handle down to the center position first, then lift the handle all of the way up. Do not lower the handle all the way down and then lift it up. It is not good for the machine to run it between forward and reverse.
8. To stop the lathe, step on the brake until the spindle comes to a complete stop, then let go of the brake. Never turn the lathe off with the handle.
9. Make sure tool bits are sharp and on center. Ask for assistance in making adjustment.
10. All tool bits that are taken from the lathe tool drawer must be cleaned and returned when finished.
11. Always clamp the tool bits as short as possible to prevent them from chattering or breaking.
12. Do not grasp any chips with your hands, use a hook, brush or pliers to remove them. If necessary, stop the lathe to remove chips.
13. When setting the automatic feed, make sure the tool is a safe distance away.
14. If any filing is done on work that is revolving in the lathe, file left handed (with both hands) to prevent slipping into the chuck. Never use a file without a handle.
15. Stop the machine before taking measurements.
16. Never try to take too heavy of a cut or try to rush through a part.
17. Never walk away from the machine while it is running.
18. If work is turned between centers, make sure that proper adjustments are made between centers and that the tailstock is locked in place.
19. Always clean the machine and make sure that everything is cleaned and put away. Remove tool bits from the tool post and drill chuck before cleaning the machine.

MILLING MACHINE SAFETY RULES

1. Always wear eye protection.
2. If you've never used this machine before, ask for assistance first.
3. Work must be clamped securely in a vise or to the table.
4. Always make sure you are using the right speeds. Some mills need to be running to change the speed and some need to be stopped. Know which machine you are using, ask for assistance if you are not sure.
5. Always use cutters that are sharp and in good condition.
6. After putting a cutter into the collet, remove the drawbar wrench immediately. Never leave the wrench on the nut.
7. Make sure that the spindle is running in the right direction before cutting the material.
8. Never put the mill into or out of low gear until you have been instructed in the proper procedure.
9. Always make sure the cutter is clear of the part before taking a cut.
10. Make sure the table is not locked before taking a cut.
11. Never take too heavy of a cut or try to rush through a part.
12. When setting the automatic feed, make sure the cutter is a safe distance away.
13. Always stay at the machine while it is running.
14. Make sure the machine is fully stopped before taking any measurements.
15. Always use the spindle brake to stop the spindle after turning the machine off.
16. When removing a tool from the spindle, always fold up a rag and put it on the table under the tool. Hold the brake to loosen the drawbar nut with the drawbar wrench. When the nut is loose enough to turn by hand, only turn it ONE HALF TURN. Then, hold the tool with your left hand (do not pull down on the tool) and hit the nut with the brass part of the wrench. To remove the collet, hold the collet with your left hand (do not pull down on the collet) and turn the nut until the collet comes out of the spindle.
17. Make sure all tools are cleaned and put back where they belong.
18. Always clean the mill when finished. Make sure cutters are removed before cleaning to prevent being cut.

CALIPER USE

1. Always clean your hands before you use the calipers. If chips get in the tract from your hands (or the machine), it will greatly compromise the accuracy of the calipers or make them completely useless.
2. Always keep the calipers closed up in the case when not in use, if the calipers are not in your hand they are not in use.
3. When you are finished using the calipers, put them in the case and close it tight, this will keep them protected and prevent them from getting dirty with chips from the machine.
4. If they fall off a machine and land on the floor, they will be protected from getting ruined if they are in the case.
5. There should NEVER be any chips, oil or dirt on the calipers or in the case at any time.
6. If you drop or damage the calipers you must let the shop supervisor know.