



MAKER LAB Safety Instructions

Basic Training

Information about the Maker Lab

The tools and equipment in the Maker Lab in Guadalupe Hall are available to SCU students, staff, faculty and affiliates. Anyone wishing to use the tools, equipment and this facility must first successfully complete the safety orientation training provided in these safety instructions.

Equipment-specific training and demonstration of competency is required for the use of specific equipment located in the Maker Lab. We have divided the tools and equipment available in the Maker Lab into 3 categories. In order to use the tools/equipment below, you must be trained and approved for use in that category.

Basic Training:

- General hand tools such as screw drivers, wrenches, hand saws etc.
- Hand Power Drill
- Hot Wire Cutter
- Injection Molder
- Metal Working Equipment
- Plastic Bending Machine
- Sewing Machines
- Silhouette Vinyl Plotter
- Soldering Iron
- Vacuum Forming Machine

Power Tool Training:

- Dremel Rotary Tool
- Drill Press
- Orbital Jig Saw
- Reciprocating Saw
- Trim Saw

Specialty Tool Training:

- CarveWright Table Router
- Carvey CNC Mill
- Compound Miter Saw
- Epilog Laser Cutters
- MakerBot 2X, Prusa i3 MK3, Ultimaker 3 Extended and UP Mini 2 Rapid Prototyping Machines
- OtherMill
- Sherline CNC Milling Machine
- ShopBot Table Router
- Voltera

See website for full list of tools and equipment.

This equipment-specific training is provided by Maker Lab Staff. All potential student users must read this safety handout, sign that they understand and will follow the requirements established in the General Safety Guidelines document, and complete the safety training before using the tools and equipment in the Maker Lab.

The goal of this handout is to summarize the risks that are inherent in using power equipment and tools, and to provide guidelines for working safely. It is **not** intended to be safety training manual. The first step in preventing personal injury or equipment damage is to make sure that you know how to operate the equipment you will be using correctly. **If you are unsure – ask!**

Inattention, hurried work, horseplay, bad judgment, fatigue, “last-minute” fabrication, improper clothing, defective tools, dull cutting tools, and poorly secured work pieces can cause accidents. Avoid accidents by following all of the rules in this handout and asking for help if you are unsure about any aspect of the operation or process, especially regarding safety.

Disregarding lab rules or working unsafely will result in suspension or revocation of lab privileges depending on the severity of the infraction.

In an Emergency:

Call 4444 from the lab phone (or 408-554-4444 from a cell phone), or 911 from a cell phone.

The Maker Lab is located in Guadalupe Hall, 3rd Floor, Room 301

Maker Lab Website: scu.edu/engineering/makerlab

Maker Lab E-mail: scumakerlab@gmail.com

Lab Access

General lab access will only be granted to those who have the appropriate level of skill and knowledge and have completed safety training and testing. Basic Training is the minimum requirement that must be completed in order to use the Maker Lab.

The chart below describes the Laboratory access requirements to **use** the Maker Lab:

Laboratory User Category	Access and Use Limitations	Training Requirements
<ul style="list-style-type: none"> • SCU students receiving academic credit for projects • SCU students doing extra-curricular projects • SCU TAs and RAs • SCU Professors • SCU Staff 	<ul style="list-style-type: none"> • Access is only allowed during hours of operation with a Maker Lab Supervisor present • Use is limited to equipment for which user has been trained, as listed on the Equipment Authorization form • Must have SCU photo ID 	<ul style="list-style-type: none"> • Basic Training: Minimum requirement to use facility <ul style="list-style-type: none"> ○ Read Safety Instructions ○ Sign Basic Training Safety Guidelines ○ Complete Basic Training safety training ○ Complete Basic Training Quiz (100%) • Power Tool Training: Must complete Basic Training <ul style="list-style-type: none"> ○ Read Safety Instructions for Power Tool Training ○ Sign Power Tool Training Safety Guidelines ○ Complete Power Tool Training safety training ○ Complete Power Tool Training Quiz (100%) • Specialty Tool Training: Must complete Basic Training (Authorization per equipment) <ul style="list-style-type: none"> ○ Read Safety Instructions for equipment ○ Sign Equipment Safety Guidelines ○ Complete Specialty Tool Training safety training • Complete Specialty Tool Training Quiz (100%)
<ul style="list-style-type: none"> • Department visitors 	<ul style="list-style-type: none"> • Must be approved by Professor Kitts • Access is only allowed during hours of operation with a Maker Lab Supervisor present • Use is limited to equipment for which user has been trained, as listed on the Equipment Authorization form 	<ul style="list-style-type: none"> • Visitor Safety Guidelines reviewed • Informed consent, waiver, and release must be signed prior to or upon entry. • Relevant equipment-specific operation and safety guidelines reviewed by Maker Lab Staff.

Use of equipment is permitted only as approved on the Equipment Use Authorization Form. **Users are only allowed to use the Maker Lab when an approved Maker Lab Supervisor is present.**

The Maker Lab is closed between 10 pm and 7 am.

Open hours can be found posted on the SCU Maker Lab Website: scu.edu/engineering/makerlab

The chart below describes the Laboratory access requirements to **supervise** the Maker Lab:

Laboratory Supervisor Category	Access and Use Limitations	Training Requirements
<p>Supervising for course use</p> <ul style="list-style-type: none"> • SCU TAs and RAs • SCU Professors 	<ul style="list-style-type: none"> • Must be approved by Professor Kitts • Operation and supervision of equipment not allowed without training • NOT authorized to train users. • Must schedule hours of operation. • Responsible for <ul style="list-style-type: none"> ○ Supervising use of the facility for course use 	<ul style="list-style-type: none"> • Must complete training for equipment supervising <ul style="list-style-type: none"> ○ Basic Training required ○ Power Tool Training and/or Specialty Tool Training is optional based on supervising usage • Must complete Supervisor Training
<p>Supervising for general Maker Lab use</p> <ul style="list-style-type: none"> • SCU students • SCU TAs and RAs • SCU Professors • SCU Staff 	<ul style="list-style-type: none"> • Must be approved by Professor Kitts • Operation and supervision of equipment not allowed without training • NOT authorized to train users. • Must schedule hours of operation. • Allowed access to Basic Tools and Laser Cutter/MakerBot 3D printer (based on training) without an additional person present. • Responsible for <ul style="list-style-type: none"> ○ Supervising use of the facility for Maker Lab Open Hours 	<ul style="list-style-type: none"> • Must complete training for equipment supervising <ul style="list-style-type: none"> ○ Basic Training required ○ Power Tool Training and/or Specialty Tool Training is optional based on supervising usage • Must complete Supervisor Training • Must complete supervised hours
<ul style="list-style-type: none"> • Maker Lab Staff 	<ul style="list-style-type: none"> • Must be approved by Professor Kitts • Allowed access to Basic Tools and Laser Cutter/MakerBot 3D printer (based on training) without an additional person present. • Responsible for <ul style="list-style-type: none"> ○ Supervising use of the facility ○ Providing Training 	<ul style="list-style-type: none"> • Must complete Basic Training, Power Tool Training, and Specialty Tool Training • Must complete Maker Lab Staff Training • Must complete supervised hours



Basic Training: General Safety Guidelines

Emergency Information

1. **Injuries:** For immediate help notify Campus Safety at x4444 (408-554-4444) and follow their directions. Do not attempt to remove foreign objects from the eye or body; it is better to have trained medical personnel remove foreign objects from the eye or body.

Being ready to work

2. **Design before you build. Think** through the entire job before starting. Ask for help if you have questions.
3. **Do not operate equipment unless you have been properly trained to do so.** If you're unsure about the safe operation of a tool or any aspect of a job – ask for help. **If you can't do it safely, don't do it!**
4. **Never work when you are impaired.** Do not drink alcoholic beverages before or during work in the lab area. Do not work when you are under the influence of any substance that can impair judgment or alertness. Do not work when you are too tired, stressed or hurried to work carefully.
5. **No Horseplay** is permitted in the lab areas.
6. **Never annoy or distract** the attention of anyone operating power equipment.
7. **Do not allow yourself to become distracted** when operating power tools and equipment.
8. **Cell phones, mp3 players, and other personal electronic devices must not be used** when operating power equipment and tools. No headphones or earbuds. Loud music is prohibited. Nothing should be distracting you from the safe operation of the tools and equipment.

Personal Protection

9. **Never work alone.** At least two people must be in the lab at all times when operating power tools and equipment. Users are only allowed access with an approved Maker Lab Supervisor present.
10. **Hours of operation are between 7 am and 10 pm based on supervised hours.** The Maker Lab is closed between 10 pm and 7 am, including 3D printing.
11. Keep your fingers and hands **clear of the point of operation** of equipment. Always use special tools or devices, such as push sticks, hooks, pliers, etc. **Never use a rag near moving machinery.**
12. **No ties, loose clothing, lanyards, or jewelry, etc.** around moving or rotating equipment. **Long hair must be tied back** or covered whenever in the lab, to prevent contact with moving machinery.
13. **Must wear long pants** whenever in the lab. No shorts, skirts, or dresses.
14. **Must wear safety glasses with side shields whenever in the lab.** Safety glasses which meet ANSI Standard Z87.1 for safety are provided and are required in the lab.
15. **Must wear sturdy, closed-toe shoes whenever in the lab.** Tools, chips and fixtures are sharp, and often heavy. Shoes will help protect your feet from injury.
16. When handling sharp and hot objects, **wear appropriate gloves.** **Do not** wear gloves when operating rotating equipment such as drill presses and grinders.
17. **Wear hearing protection when operating or working around loud equipment** such as saws, sanders, grinders and routers.
18. **Wear dust mask and/or provide appropriate ventilation** when working around dust, smoke, and fumes.
19. **Never put or carry nails, screws, or other objects in your mouth.**
20. **No eating or drinking** is allowed in the Maker Lab.

Shop and Tools

21. Sign in and get safety equipment when entering the lab.
22. **Always keep aisles, exits and access to emergency equipment** (fire extinguishers, fire alarms, first aid kit) clear at all times.
23. Do not enter **Operator Zones** marked on the floor unless trained on the equipment.
24. **Examine power equipment** and tools before use to make sure they are safe to operate:
 - Check that exposed moving parts of power equipment are safeguarded- all belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment must be enclosed with guards that are properly secured and adjusted. **Never operate equipment unless all required guards and shields are in place.**
 - Verify the overall condition of the equipment (e.g., damaged power cord, visible cracks, or defects in the tool housing or anything that would compromise the safe use of the tool).
 - **Do not** operate equipment in which any of the deficiencies above are noted. Immediately report unsafe equipment to Maker Lab Staff.
25. **Shut off** and disconnect power tools before cleaning, adjusting, or performing set-ups.
26. Before starting power equipment, always **check it for correct setup** and, if possible, check to see that the point of operation is clear by operating it manually. Make sure chuck keys and tools have been removed from the equipment.
27. Must use Bench hooks to protect table tops when using the drills, or cutting tools when appropriate.
28. **Clean up after yourself.**
 - Keep the floor around equipment and benches clean, dry and free from trip hazards. Do not allow scraps of wood, materials and sawdust to accumulate.
 - **Never dispose of chemicals** in the standard trash or by dumping them into sink or floor drains. Only equipment used with water-based paints may be cleaned in the lab sink.
 - Any waste containing oil, gasoline, alcohol, shellac, paint, varnish, lacquer, or other flammable materials must be disposed of in the hazardous waste bin.
29. **Before you leave the lab each day, all tools and equipment must be put away, the equipment thoroughly cleaned and wiped down, extension cords must be stored, and the floor swept. Always leave 10-15 minutes for cleanup.**
30. We do not allow storage of personal material or equipment in the lab so be sure to take your belongings with you.
31. Return safety equipment and sign out of Lab when leaving.

Sign and date in space provided, verifying you have received a copy of and have read and understand the safety instructions.

Name: _____	SCU ID: _____
Signature: _____	Date: _____
E-mail: _____	Department: _____
Circle- Undergraduate/Graduate/Staff/Faculty/Affiliates	
For students- Expected graduation year: _____	

Office Use Only- Maker ID Number: _____



Basic Training: Power Hand Tools Safety Guidelines

1. Always wear safety glasses when using power tools. Wear hearing protection when using routers, power sanders, and other high noise tools.
2. Unplug the tool/disconnect the battery before cleaning, making any adjustments, or changing blades/bits.
3. Before using any power tool, inspect it to make sure it is in safe condition:
 - a. The cord or battery is not damaged in any way, that the ground pin is intact, and that the blade is sharp and undamaged.
 - b. The trigger or actuator locks and guards are in functional order to prevent accidental activation.
 - c. Hand-held power tools must be equipped with a properly functioning constant-pressure switch.
4. Do not use power tools in a wet area.
5. Do not run extension cords across walkways where people might trip over them or where the cord may be damaged. Put extension cords away after use. Use grounded extension cords for tools having grounded plugs.
6. Inspect stock prior to starting cut, examining carefully for nails and other metallic objects. If such material is discovered, it must be removed or steps taken to prevent the object from coming into contact with the saw blade.
7. Don't carry power tools with your fingers on the switch trigger.
8. When using power saws, always use the proper blade for the type of cut to be made.
9. Do not use the cord to move or drag a power tool.
10. Only use a power tool when you can keep a firm and secure grip on the tool and the material being cut is secure. A manual tool may be the best solution for some types of work and may even be faster.
11. Before cutting or working on small work pieces they must be clamped or secured, consult with Maker Lab Supervisor.
12. Use a vacuum or dust collector whenever possible to collect dust while using any tool that generates dust. If airborne dust is present, a dust mask should be worn.





Basic Training: Hot Wire Cutter Safety Guidelines

1. Use Hot Wire tools only for their intended use. **Use only with polystyrene foam.** Check with the manufacturer of the foam you plan to cut to make sure there are no health or safety hazards when cutting their foam with hot wire tools.
2. **Use portable fume extractor** when the Hot Wire Cutter is in use. If you see or smell smoke coming from the foam, turn the heat control knob down to the proper melting temperature.
3. Wear eye protection at all times the Hot Wire tools are plugged in.
4. Do not allow cord to touch hot surfaces. Never carry tool by cord or yank it to disconnect from outlet. Do not allow cords to touch the cutting wires or knife- this may short them and produce fire or electric shock.
5. **Unplug** Power Supply before leaving it unattended.
6. Don't use electrical tools in damp or wet locations. Prevent body contact with grounded surfaces.
7. Do not operate Hot Wire tools in the presence of explosive and/or flammable fumes or materials.
8. Burns can occur from touching the hot cutting wire when it is at normal operating temperature. The Engraving Tool stays very hot for several minutes after the tool is turned off. To reduce risk of burns never touch metal parts of the Engraving Tool. Never set tools down while they are turned on, as they can cause a fire and short out.
9. Disconnect power cord when changing cutting wire or fuse. Consult Maker lab Staff for replacement of fuses and cutting wires.
10. Inspect the tools before and after use for worn or broken parts.





Basic Training: Injection Molding Safety Guidelines

1. Always wear safety glasses or goggles. Heat-resistant gloves are available to prevent burns to your hands.
2. Keep clothing and other combustible objects away from the injection molder.
3. Never touch any of the metal parts during operation. Only touch the foam covered handle.
4. Do not use flammable liquids or operate the machine near flammable liquids, vapors or other combustible materials.
5. Make sure the machine is secured to the bench before operating the machine. The machine must be clamped to the workbench. Be aware, the force required on the feed lever can be enough to cause the machine to tip over.
6. During operation, melted plastic may drip from the muzzle. Never touch molten plastic!
7. Never leave the heater on when the machine is unattended or not being operated.
8. Always unplug AC power from the machine when not in use or performing maintenance.
9. Allow the unit to cool before storing it.
10. Never operate the machine at temperatures above 490 degrees F.
11. Only operate the machine in a well ventilated area.
12. Do not operate the machine with a damaged power cord.
13. If you haven't used an injection molding machine before or have any questions, ask for help!
14. If you burn yourself, inform Maker Lab Supervisor and immediately run cold water over the burn for 15 minutes.





Basic Training: Metal Working Safety Guidelines

Rotary Shear

1. Inspect your workpiece for sharp edges and defects.
2. Make sure all clamps and locks are tight.
3. Set up and secure guides if necessary.
4. Guide your part into the blade, once contact is made use the ratcheting cutting handle to pull the material in and cut it. Guide the material as needed.
5. Watch for share edges and file down if needed.
6. If you haven't used a rotary shear before or have any questions, ask for help!



Box and Pan Brake

1. Inspect your workpiece for sharp edges and defects.
2. Make sure all clamps and locks are tight. Adjust the height of the upper press assembly if needed.
3. If making a box or pan, choose the appropriate die or die assembly close to your desired length.
4. Position your part at the brake line.
5. Make sure all hands and objects are removed from the brake point.
6. Lift handle to bend material.
7. Watch for share edges and file down if needed
8. If you haven't used a box and pan brake before or have any questions, ask for help!



Slip Roll

1. Inspect your workpiece for sharp edges and defects.
2. Make sure all clamps and locks are tight. Adjust the rollers if needed.
3. Roll your part into the machine, once contact is made use the handle to pull the material in and bend it. Guide the material as needed.
4. If performing a partial roll, slide out the shaft release rod and pull the top roller forward to remove the material.
5. Watch for share edges and file down if needed
6. If you haven't used a slip roll before or have any questions, ask for help!





Basic Training: Plastic Bending Machine Safety Guidelines

7. Place the unit upright with the exposed heating element facing up and plug into a grounded outlet.
8. Make sure heating element is clean of any debris and not near flammable materials.
9. Turn the unit on and allow it to come to operating temperature (approximately 10-12 minutes).
10. Place the plastic work piece to be formed on the work surface with the area to be formed over the element.
11. Turn the piece over at regular intervals to insure plastic is heated evenly.
12. Various plastics and thicknesses take different amounts of times to heat. Trial and error testing on scrap pieces is recommended to ensure best possible results on actual part.
13. When done, turn off and unplug the unit. Let heating element cool to room temperature.
14. If you haven't used a plastic bending machine before or have any questions, ask for help!





Basic Training: Sewing Machine Safety Guidelines

1. While in operation, always keep your eyes on the sewing area. Do not touch any moving parts, such as the thread take-up lever, handwheel or needle.
2. Always turn off the power and unplug from the power supply when leaving the machine unattended, attaching or removing any parts, or when cleaning the machine.
3. Do not place anything on the foot control when not sewing.
4. Always use the proper needle plate. The wrong plate can cause the needle to break.
5. Do not use bent needles.
6. Do not pull or push fabric while stitching. It may deflect the needle causing it to break.
7. If you haven't used a sewing machine before or have any questions, ask for help!





Basic Training: Soldering Safety Guidelines

1. Hot solder can spatter, so always wear safety glasses or goggles. Heat-resistant gloves are available to prevent burns to your hands.
2. Never touch the element or tip of the soldering iron.
3. Always return the soldering iron to its stand when not in use.
4. Work in a well-ventilated area. Use the portable fume extractor. Consult with Maker Lab Supervisor on proper set up of the fume extractor.
5. Only use lead-free solder.
6. Keep the cleaning sponge wet during use.
7. Allow joints and components to cool before touching them.
8. Turn soldering iron off or unplug it when not in use.
9. Wash your hands after using solder.
10. If you haven't soldered before or have any questions, ask for help!
11. If you burn yourself, inform Maker Lab Supervisor and immediately run cold water over the burn for 15 minutes.





Basic Training: Vacuum Forming Machine Safety Guidelines

1. Keep work area clean.
2. Always wear protective gloves.
3. Always turn off and unplug the machine when not in use.
4. Do not let material touch any part of the oven at any time.
5. Never touch the oven unless you are certain it is not hot.
6. Never use the machine for something it was not designed for.
7. Use safe plastics that are recommended for vacuum forming.
8. If you are unsure how to use it, ask for help!

