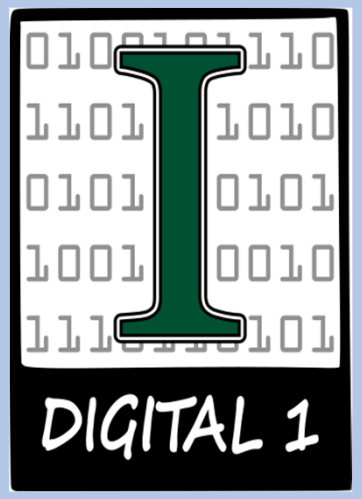
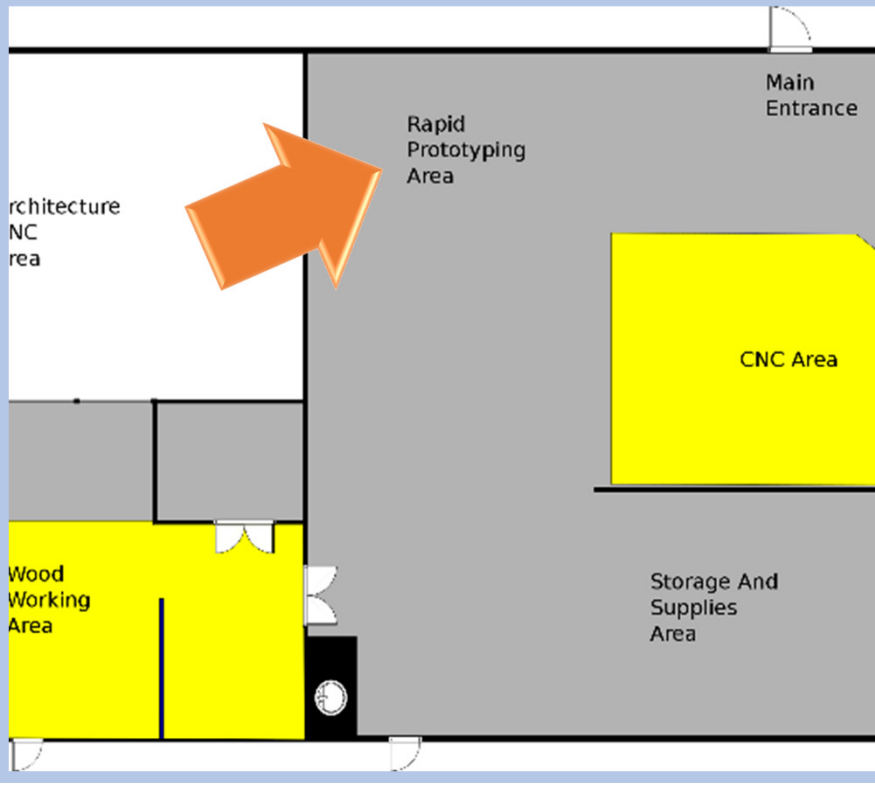
Tulane MakerSpace

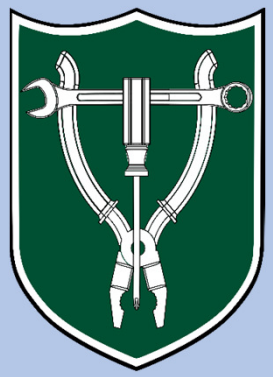
Digital-1 Training Presentation



Digital-1 Training

- **MakerSpace Layout:**
  - **This presentation will focus on tools in the "Rapid Prototyping Area", which is used for developing prototypes and short term models.**
  - **This area is a "gray zone", meaning no specific Personal Protective Equipment (PPE) is required to enter.**
  - **Training for the Digital-1 Badge requires completing this presentation and quiz, plus making the two parts described on the website.**



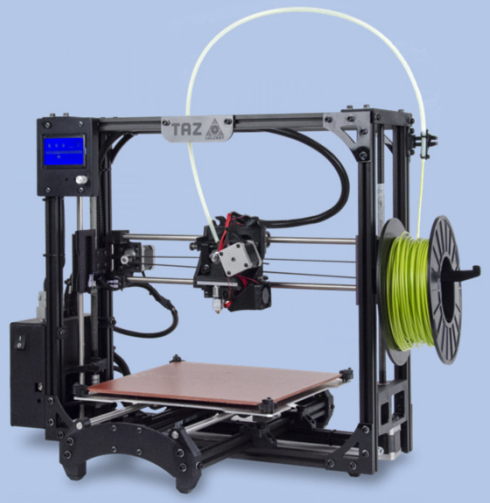


Tulane MakerSpace

3D Printing

3D Printing

- **Our main printers include Lulzbot Taz and Ultimaker machines.**
- **Both of these printers create models by depositing material from above the build-plate.**
- **Because of this, sometimes support material is needed, since they are unable to deposit material on top of nothing.**
- **To speed up print times and improve models, its important to keep this in mind for your design.**

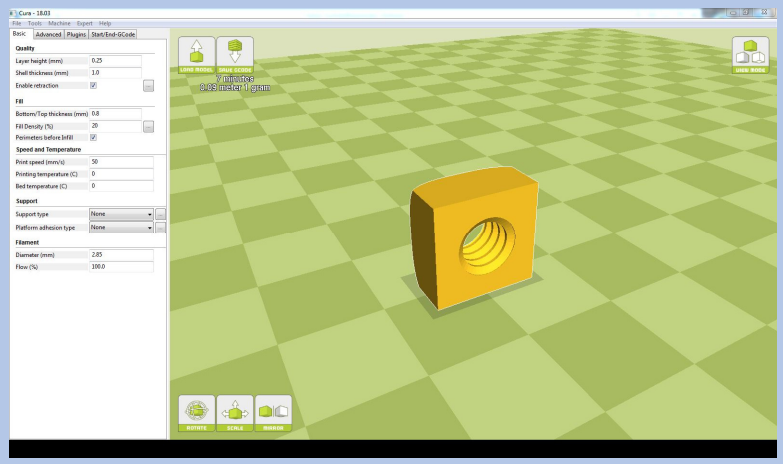


Lulzbot Taz 5

Ultimaker 2

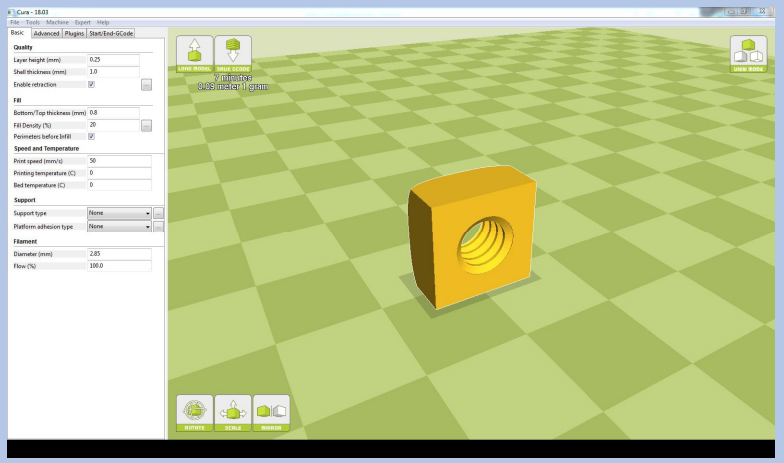
3D Printing

- **Once you have a suitable model saved as an .stl or .obj file, you will need to translate it into the language of the printer (called "gcode"), using "slicing" software.**
- **The slicing software that we recommend is Cura.**
- **There are separate versions of Cura for each of our printers. All versions are installed on the computer by the 3d printers in the MakerSpace.**
- **Remember, every printer has its own language, so you can't use instructions for one printer on a different printer**



3D Printing

- **In Cura, you can adjust the settings as you wish or just use the recommended print settings.**
- **Printers require a surface on which to layer the material, so often you'll need to print support structure in order to support overhanging sections of your model.**
- **Cura can generate support structure for your model, just choose to add support "everywhere".**
- **Once the print is finished, the support structure can be removed from the model by peeling it away.**

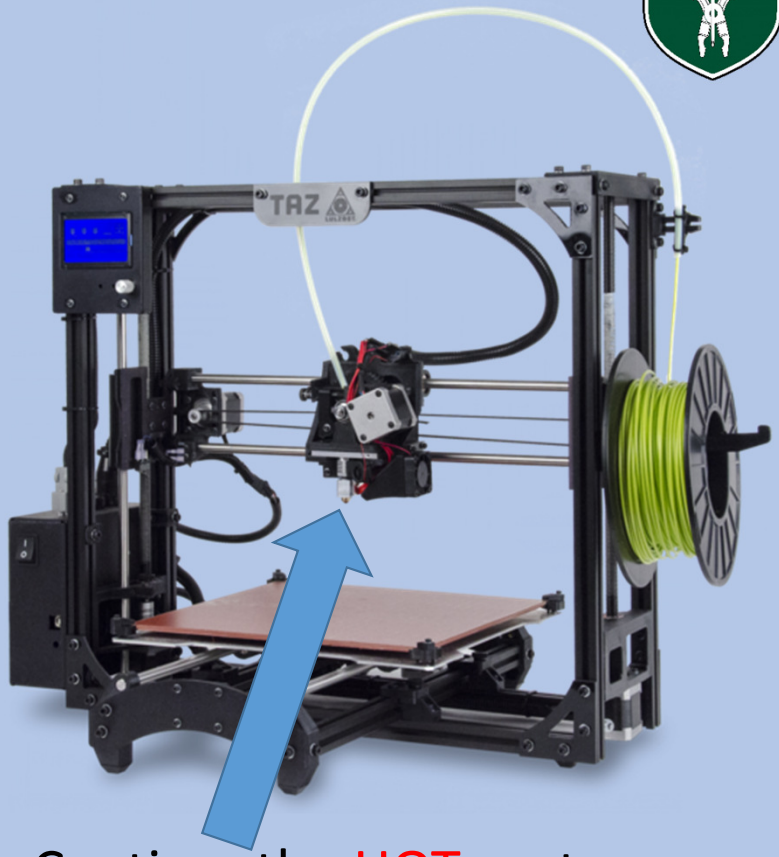


3D Printing

- **For models with a small surface area, it is also a good idea to print a "brim" around the model. The brim is a layer of plastic that helps the model stick to the print surface.**
- **You shouldn't need to adjust any other settings unless you are using different filaments or have specific preferences.**
- **When your model is ready, save the gcode instructions to a standard SD card. Insert the SD card into the printer and select your file to begin.**
- **When your print is finished, let the print bed cool down and then remove your print.**

3D Printing

- **SAFETY:**
  - **The nozzle which extrudes the plastic will be HOT. Do not touch it while it is heated and make sure to let it cool before working on the machine.**
  - **The print bed will also be hot. Allow it to cool before removing your part.**
  - **3d printers have moving parts that can pinch. Be careful when working around them to keep fingers away from any pinch-points.**



Caution, the HOT part is HOT.

Tulane MakerSpace

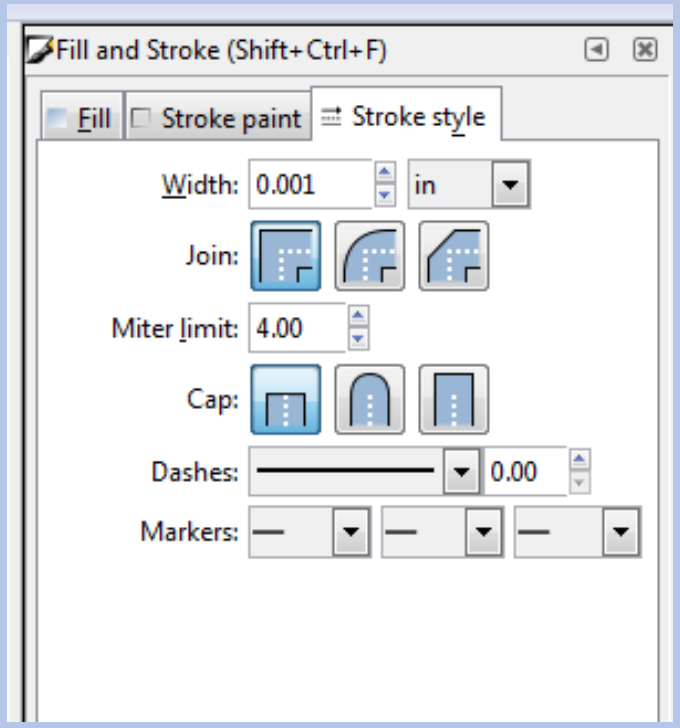
Laser Cutting/Etching

Laser Cutting/Etching

- **A Laser Cutter is a machine which uses a high-power (invisible) laser to trace out and mark specific paths on your materials.**
- **Laser cutters can be instructed to "cut" through the material along lines, or "etch" (engrave) the material by leaving a precise mark on it.**
- **The MakerSpace uses Epilog Helix 50 Watt laser cutters, which use CO_2 lasers to emit an infrared beam of light onto the material.**

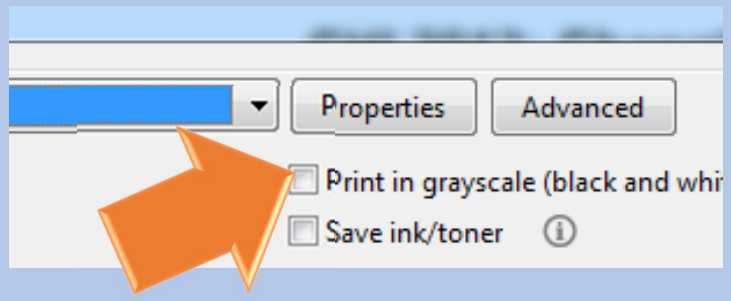
Laser Cutting/Etching

- **A laser cutter requires different instructions for cutting or etching (engraving) the material.**
  - **Any image that is sent to the laser cutter will be etched/engraved into the surface of the material.**
  - **However, the laser will cut through any line that is 0.001 inches thick (or "hairline" in some programs).**
  - **It is important to use "Vector" graphics software when creating your design. E.g., Inkscape (recommended), CorelDraw, Adobe Illustrator, Powerpoint, etc.**



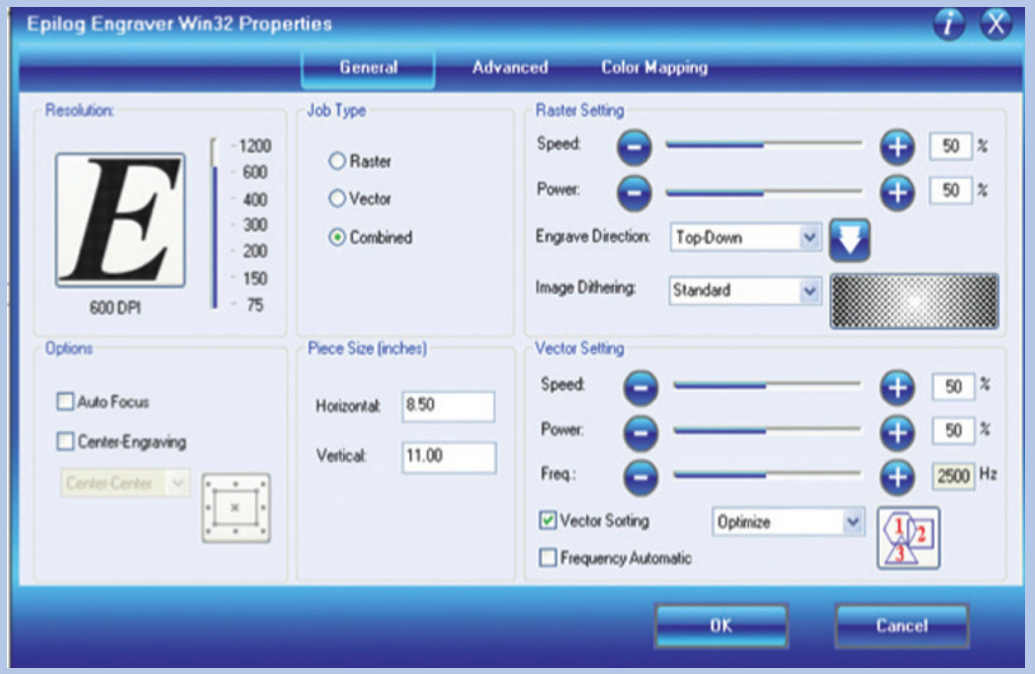
Laser Cutting/Etching

- **When designing for a laser cutter, the only major issue is denoting which lines are to be cut, and which are to be etched.**
- **Once your design is completed, save (or print) it as a .pdf file.**
- **Open the .pdf file on the computer connected to the laser cutters, and select "Print".**
- **Select the laser cutter you would like to print to, and then click the "Properties" button.**



Laser Cutting/Etching

- **Upon selecting the "Properties" button, a new screen will appear that allows you to adjust the settings of the machine.**
- **The appropriate settings will depend on the material you are working with. E.g., the settings for wood, plastic, cloth, and paper are very different.**
- **There is a simple chart on the MakerSpace website with settings for different materials.**



Laser Cutting/Etching

- **Once your settings are complete, click "OK" then click "Print" and the instructions will be sent to the laser.**
- **As the laser receives the instructions, a green light will blink, then your filename will show up as a job on the machine.**
- **Now you need to make sure your material is set up correctly, and then press the green "Go" button on the laser and it will start.**

- **NOTE: The glass door on top of the machine must be closed or the laser will be disabled.**

Laser Cutting/Etching

- **Things to remember:**
  - **Our laser cutters have a bed-size of 18″ tall by 24″ wide, and it's best to leave yourself some space around the edges.**
  - **The laser cutters will cut or etch wood, (some) plastics, rubber cardboard, fabric, paper and others. It will not cut metal, but it can etch the paint off of metal surfaces.**
  - **MAKE SURE YOUR MATERIAL IS LASER SAFE! Some plastics have a tendency to melt and start fires, others release toxic fumes (esp. PVC) that can destroy the machine or poison users.**
    - **There is a list of tested materials with SAFE/NOT SAFE instructions on the MakerSpace website.**

Laser Cutting/Etching

- **SAFETY:**
  - **Never leave a working laser cutter unattended.**
    - **Fires are relatively common, and someone needs to be nearby in case one breaks out in a laser cutter.**
  - **Do not put random objects into a laser cutter unless you absolutely know what they are made of.**
    - **The difference among acrylic, polycarbonate, and PVC is that one will work great, one will create a huge mess, and one will release a toxic nerve agent into the air.**
  - **Do not try to "trick" the machine's safety settings.**
    - **If you want to try something unique, talk to a Ninja and they'll determine whose permission you might need.**

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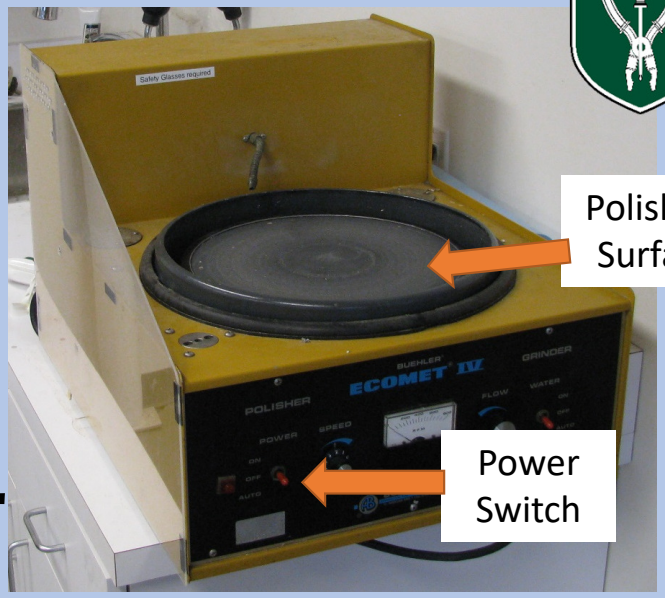
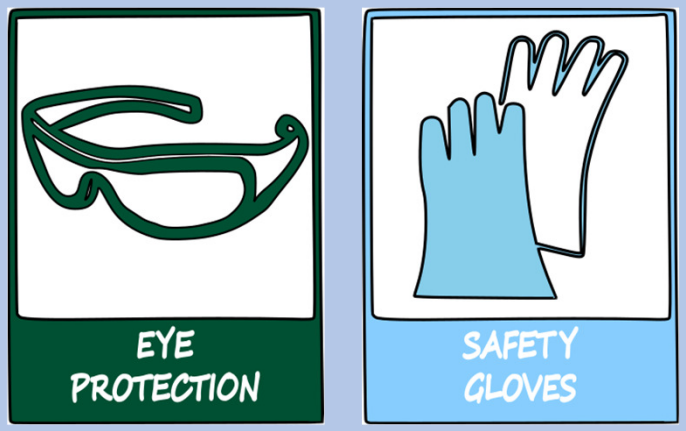
Finishing Models

Finishing Models

- **Wet Sander**
  - **The wet sander can be used for sanding/polishing aluminum and plastics.**
  - **Simply turn the machine on and hold your part against the polishing surface.**

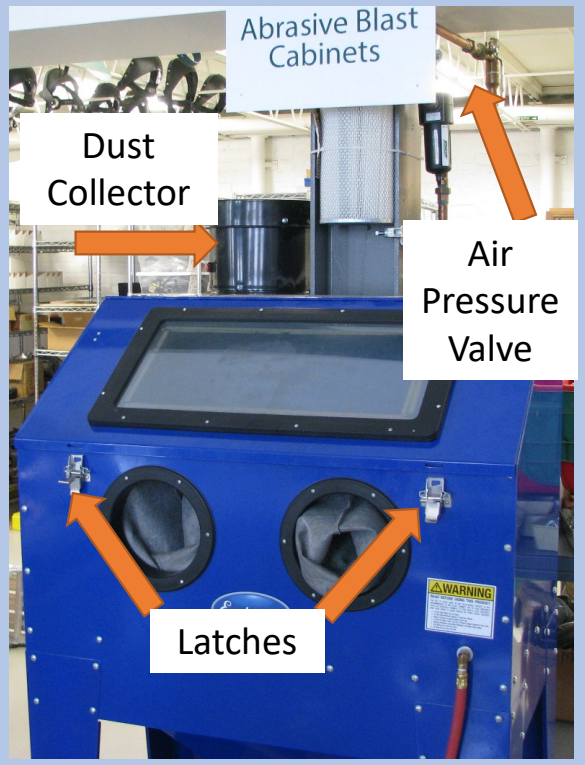


- **SAFETY:**
  - **Eye Protection is required to use the wet sander.**
  - **Safety Gloves are recommended, especially if you are polishing a small object.**



Finishing Models

- **Blast Cabinet**
  - **The blast cabinet can remove paint or smooth objects using glass beads (more abrasive) or walnut shells (less abrasive).**
  - **Place your object inside the cabinet and latch it. Then turn on the air pressure and the dust collector.**
  - **Place your hands in the gloves and use the spray nozzle to smooth the object.**



- **SAFETY:**
  - **Be sure that the cabinet is fully latched before using it.**
  - **Remember to turn off the air pressure when you are finished.**

Finishing Models

- **Spray Paint**
  - **For many 3d models, spray paint can be the simplest method for painting them.**
  - **To paint an object, take it outside and place it on cardboard or cloth to protect from overspray.**
  - **Do not paint on concrete sidewalks or drives. Find an area of dirt or gravel. Use plenty of cardboard to prevent overspray.**

- **SAFETY:**
  - **DO NOT USE SPRAY PAINT INDOORS.**
  - **All spray paint MUST be stored in the fire-proof cabinet.**
  - **Do NOT use spray paint near any type of heat source or open flame.**
  - **Fumes can be dangerous, avoid breathing them and ask if you need protection.**