



Laser Cutting and Adobe Illustrator

Goals:

- Understand how the laser cutter works and what you can make with it
- Understand how to create your own designs using Adobe Illustrator

Key Terms

Laser Cutter: A prototyping machine that uses a laser beam to cut or etch designs and products.

Etching: Also known as *engraving* or *rastering*. Etching carves shapes and text into the top layers of the material's surface without fully cutting through the material.

Cutting: Also known as *vectoring*. Cutting creates text and shapes by fully removing material being cut into.

Hairline width: The width of the line at 0.072 pt or less.

Cut bed: Surface where the material that will be cut or etched is placed.

Gantry: A bridge-like frame structure that supports and moves the laser cutter's lens according to X, Y, and Z coordinates.

Ventilation: The ventilation system carries away the toxic gas, smoke, small particulate matter, and odors that the laser creates. The ventilation keeps the laser cutting process safe for people in the room.



Key Questions:

What can a laser cutter do?

A laser cutter can *cut* or *etch* 2D designs in a number of materials including wood, cardboard, acrylic, leather, and many more. Laser cutters are great for simple projects like keychains or bookmarks, as well as more complex projects like lampshades or the interlocking pieces of a 3D laptop stand.

How does the laser cutter work?

The laser cutter uses a set of four mirrors to focus a laser beam to the point that it burns the material on the *cut bed*. (This is like when you focus a magnifying glass so it lights a piece of paper on fire). The *gantry* on the laser cutter will move the fourth and final mirror and the corresponding lens around so that the laser beam burns the material in the desired shape.

Because burning create smoke and fumes, which can be dangerous to humans, proper *ventilation* is extremely important.

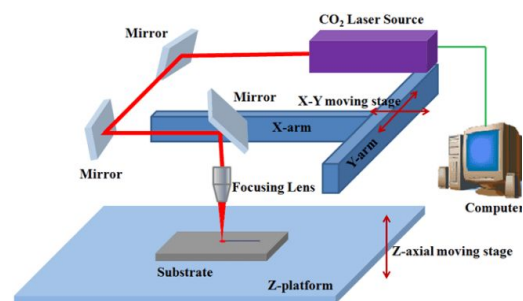
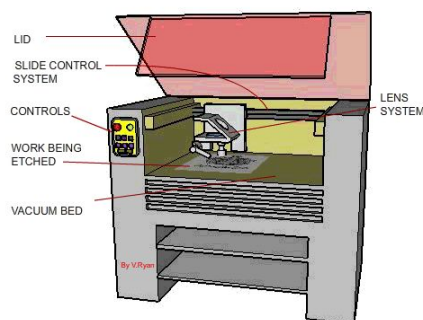


Image source: TechnologyStudent.com



How do I create a design for the laser cutter?

In order for the laser cutter to make what you want, you need to create a 2D design that speaks to the laser cutter in the language it understands. Adobe Illustrator is one program that can do this, and we will use it throughout this class. Other, free programs include Inkscape and Vecteezy.

- If you want the laser cutter to *cut*, you will have to create a *hairline-weight* line. This is how the laser cutter knows you want to cut.
- If you want the laser cutter to *etch*, you can create a thicker line or a filled-in shape. The laser cutter will interpret these as *raster* images and will etch.

Additional Resources:

- [Thingiverse](https://www.thingiverse.com)¹ provides downloadable designs and projects for laser cutting and 3D printing.
- [Laser-cut Pixar lamp](https://makezine.com/projects/laser-cut-pixar-luxo-lamp/)²
- [Laser-cut nori for sushi](https://makezine.com/projects/laser-cut-sushi/)³
- [Laser cutting techniques and project ideas](https://makezine.com/2013/10/23/tutorial-laser-cutting-techniques-and-projects/)⁴

Exercise: Bookmark Design

Goal: The goal of this exercise is to create your own bookmark using the laser cutter, Adobe Illustrator, and the techniques we went over in this session. The steps here are purposely vague—we want you to be creative in designing your bookmark. Ask questions about things you don't understand, but don't worry if your steps are different from others in class.

Step 1: Start with a shape you want your bookmark to be in—probably a rectangle, but you can think outside the box too! Draw this shape in Adobe Illustrator. Remember to pay attention to things like the line stroke, color, etc.

¹ <https://www.thingiverse.com>

² <https://makezine.com/projects/laser-cut-pixar-luxo-lamp/>

³ <https://makezine.com/projects/laser-cut-sushi/>

⁴ <https://makezine.com/2013/10/23/tutorial-laser-cutting-techniques-and-projects/>



Step 2: Fill in the bookmark shape with whatever text you want.

Step 3: Play with different elements of the text (size, line stroke, color). Think about the three different letter examples and decide how you want the bookmark text to appear (cut vs. etch).

Step 4: Adjust the settings for the printer. Things to adjust include placement, piece size, auto focus, laser speed.