Laser Cutting and Engraving
What is Laser Cutting?

Laser cutting is a technology that uses a high power laser to cut through sheet materials.

Laser cutters work by directing a laser beam at a precise focal length onto a material that is either cut or etched, depending on the settings.
### Laser Settings

- **Power**: Amount of energy going into the laser
- **Speed**: The speed the laser is moving at
- **DPI and PPI/Frequency**:
  - Resolution of the raster
  - Pulses Per Inch for vector

Power and speed have an inverse relationship.

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**Diagram**

<table>
<thead>
<tr>
<th>Speed (%)</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
</table>
The two styles of movement for laser cutters

The laser cutter can work in two ways:

- **Vector Movement** - Follows the curvature of a line
- **Raster Movement** - Goes pixel by pixel side to side
Examples:

- **Raster**
- **Vector**
- Combination of raster and vector
Designing for the Laser Cutter

- Etching works on a grayscale, the laser will etch more in darker areas and less in light areas
- It’s important to consider the positive and negative space when creating a vector file
- You can etch any image, but cutting requires vector paths
Limitations of the Laser Cutter

- There is a limit on the depth you can etch or cut into a material
  - The laser has a focal point that it works within

- There are certain materials that can’t be used
  - Some materials such as metal, glass, and marble can only be engraved
  - The big no-nos: PVC, lexan, polycarbonate, vinyl
  - There are a many other materials that are toxic, corrosive, or just do not cut; especially with plastics always double check what the material is and if that is laserable
Epilog Laser
Setup Procedure

Ventilation and Safety
- Turn the levers on the ventilation pipes so they are open (the levers will go parallel to the pipe)
- Flip the switches to right of the laser cutter up so that they are on (this is the ventilation)
- Behind the laser cutter there is a valve for the air assist, turn that to the on position. The air assist uses compressed air to blow smoke away from the lens and prevents fires from occurring.

Setting Home & Focus
- Press the red laser symbol so that there is a green light by it (this activates a laser pointer)
- Use the up/down arrows to go to Jog mode -> use joystick to move to above material
- Use up/down arrows to go to Focus mode -> place the blue focusing triangle on the two thumb screws that are on the laser carriage -> use the joystick to move the bed up or down so that the tip of the triangle is barely touching the material
- Use the up/down arrows to go to Jog mode -> use the joystick to go to the top left corner of your material -> once there press in the joystick (it's also a button) to set the home.
Examples of Work and Processes
Holger Lippmann
5mm deep laser engraving into MDF
Piper Shepard
Handcut Muslin, Gesso, and Walnut Ink
Dimensional Construction Methods with Laser Cutting

Done on 123Dmake
General shapes can be achieved with various dimensional construction methods which can then be resurfaced.
William Plummer
Laser Cut Plywood
Hattie Odell
Laser-etched steel
Laser Etched Fruit Labels

Eliminate paper waste from stickers and make it possible to track specific lots of fruit.
Implantable Medical Device

Cannula Tube: part of an anesthetic delivery system

Laser cut plastic
Multiple kilowatt laser systems are even capable of cutting metal of a thickness of an inch or more

Our system for comparison is 60w Co2 and 20w Fiber (which is for metal)

8000w vs 20w
Job Submission Form: Once you feel comfortable you can submit jobs remotely. Remember, for each new job a submission form must be filled out.
https://docs.google.com/a/kcai.edu/forms/d/e/1FAIpQLSeWIvxaHslA1P2YukMUXLi82QZwyQIVDvIUt7jOTWfyteBIQbw/viewform

Equipment Calendar: Check here to see what equipment is available. (tip: use ctrl/command+F to search for the date eg. 2/19/2017)
https://docs.google.com/spreadsheets/d/10B6t_GCftqzzmY4aWpqvEFQxgWexBxb2VBWRqsvv46o/edit#gid=0

Epilog Laser Materials & Specs: Check here for settings for your material -- if the material is not listed get Nathan, Aldo, or a work-study to help you material test then record your findings in the below form.
https://docs.google.com/spreadsheets/d/1GEBIQSYnOJFI7OPdis0krtSPiBBrycSoa6Ox4pqNxil/edit?pli=1#gid=0