**Important notes:**

1. Undergrads must have a mentor working with them when operating manual mills.

2. Mill accessories are in and on cabinet #7.

3. Machine and work area must be cleaned after each use.

**Once a student has expressed the need for a manual mill, the first scheduled day in the machine shop with that student will be spent completing this orientation**

Before coming to the shop, the student should have the following requirements met:

1. Machine time scheduled with their mentor

 **-It is up to the mentor to dictate a system for this**

2. A blank machining plan printed off from Mindworks

Once inside the shop head over to one of the manual mills and complete the next steps:

1. Check the tram on the mill with the student. Use the reference guide with them even if you know what you are doing. They must know the reference guides exist in the shop.

 **-If the tram is not acceptable, it must be fixed before machining can occur.**

 **-Let the student know that before using the mill, tram is to be checked.**

2. Start by showing the digital read out screen, where the power button is located, and then have them turn the machine on.

3. Show how the digital read out responds to moving the table in each direction and how to set zeros.

4. Show the student how to operate the power feeds (x,y,z)

 -**Remember to always set the speed back to zero!**

5. Next grab a metrology kit and show them the edge finder. Keep the kit at the mill

6. Have them locate an appropriate drill chuck for the edge finder and show them how to take it both in and out of the machine. Have them put it back in the machine with the edge finder for the next few steps.

Now the student is ready to begin writing the machine plan as the next steps occur:

1. Have the student grab a piece of aluminum stock from the cabinet. They should measure it and put the measurements in the designated space on the machine plan.

2. Show the student how to place the stock in the vise. Now is a good time to discuss how parallels work along with the use of lead hammers.

3. Locate the forward and reverse power switch. Show them what forward and reverse do when in high and low gears then have them change between high and low gearing for practice.

4. Have them use the edge finder to zero the stock in x and y directions.

 **-Remember to compensate for the radius of the edge finder**

**Once those steps have been completed. Tell the student that they must complete the following operations on the stock and record it in their machine plan:**

1. They must use a fly cutter and face the top of the stock

2. They must use a roughing end mill

3. They must use a finishing end mill

**Watch the student and give pointers as needed. Once this has been completed they should be comfortable enough to start making their own parts.**