**Green Permit Seminar**

Introduce Yourself

* Hi my name is...I'll be your green permit instructor today. Talk a little about yourself...etc.

Safety in the shop

* The correct attire (no loose clothing or jewelry, safety glasses, closed toed shoes, long pants. Any longer sleeves must be pulled up to above the elbows. Any wrist items that can't be removed must be taped)
* Hair must be tied up to above the shoulders.
* Any and all chips are considered razor sharp. **DO NOT GRAB CHIPS WITH YOUR HANDS**
* On machines be cautious of moving parts

Overview

* Pull out prints and go over the title block (tolerances, breaking the parts edges, differences between alpha and beta, go over the operations we are going to do, show them the orientation)
* Equipment
  + Prints (how to read: call outs, hidden lines, show orientation)(BRING THE PRINT THEY WHERE GIVEN WHEN MACHINING)
  + Calipers from your checked out green box (how to use the different jaws, how to measure/zero, actually measure the part)
  + Explain how the drill chart can be helpful (specifically when measuring the tooling given to you)

The Lathe

* Safety on the machine
  + Basically avoid all rotating parts: the lead screw, clutch control rod, and chuck (the chuck can also grab the chips and throw them at you)
* Parts of the lathe
  + The chuck (tighten the marked key hole first: for consistency, allow parts to stick out 1.5X the diameter: to keep the part rigid)
  + Switches and Knobs (high/low gear, foot break, power lever, e-stop, RPM dial – and RPM calculator) To make your life easier just go left to right across the machine
  + Carriage (compound rest – make sure it's all the way forward - , x and z axis and what they do)
  + Tailstock (the lock levers, how the ram moves, and how to read the dial)
  + Digital Read Out (it’s like a grid explaining where your tool is located)
* Tool set up
  + Square the tool holder (how to insert the drill chuck, why the cutter needs to be perpendicular)
  + The cutting tool (get it from us along with the bubble level, the different types of carbide inserts and how brittle they are and that’s why we keep them)
  + Centering the cutting edge (using the bubble level, why centering the cutting edge is important)
* Machining
  + Compare ideal part set up to poor part set up (1.5x the diameter, rigidity, clamping surface)
  + RPM (run at ~800 if you don’t remember then refer to the RPM calculator on the computer, it'll give you close to the same number, explain the shop folder and how to get to the calculator)
  + Zeroing\* (zero z first: take a small make a chip zeroing it on the part, then face ~.01” and rezero. Then zero the x: make a chip and zero, turn it down slightly, then measure part leaving x where it is and put that into the DRO) Touch on surface finish
  + Turning down the boss\* (generally 0.03”-0.05” for roughing pass, show what a larger pass will do, explain roughing pass doesn’t need to look pretty, leave some material for a finishing pass, 0.01” to get a good finish) Cheat and take larger passes (saves you time and you can explain that tooling is capable of manufacturing standards)
  + Drilling\* (how deep to drill to compensate for tap lead in, difference in drill chucks between the lathe and mill, the point of center drilling what it is and how deep we go with it, remember to peck drill, zeroing the drill bit and the tailstock, then compensating for the ruler thickness, why peck drill, drilling to the correct depth using the scale on the tailstock) Drill a little short.
  + Countersink (run anywhere under 250rpm, doesn’t like to be run fast -can switch to low gear-)
  + Taping (differences between a live and dead center but use live, slight pressure by ram, 1.5 turns forward to 0.5 turns back to break chips, explain that the tap is hardened and can break if torqued too hard, almost impossible to remove broken tap from a part)
    - Use thread checker to show the class that the threads where short then show them how to fix them. (either use a bottoming tap or re-drill and tap)
  + Use a file to break the edges\* (run at ~100 RPM, hold left hand low right hand top) Remind them that all of their zeros are going to be lost before they unchuck their part
* Clean up
  + Putting the rag over the hole to use air to blow the chips out (and all other general shop policies toward using air)
  + General machine clean up (brush down with a chip brush, wipe down all small chips and excess oil with a rag, clean chip pan **DO NOT TOUCH THE CHIPS WITH YOUR HANDS**, shake out the rug and sweep, ask a shop staff to check your machine)

Milling Operations

* Safety on the mill (ALL the tooling is sharp, the spindle rotates, DRO problems I.e. abs zero and jog buttons)
* Parts of the mill
  + The 3 different axis and how to adjust each (specifically switching directions in the z and the gear, its nylon DO NOT SWITCH DIRECTIONS until it winds down)
  + Buttons and knobs (the quill, in/out buttons -show the threaded rod- , e-stops and differences, RPM rheostat, high/low gears – always make sure the cutter is rotating clockwise - )
  + DRO (show how it changes with the different axis, safely show what abs zero does along with a crashed piece)
* Tooling
  + End mill (they are sharp, DO NOT GRAB THEM)
  + Collets (5c -in shop- versus R8 -check out- , how they work/why the quill must be up to engage the threads, relate the drill chucks and the collets)
  + Parallels (precision ground)
* Setting up the part
  + Inserting the end mill and collet into the machine (clamp above the flute and below the flat, touch on the key in the collet, remember to clean mating parts and explain why)
  + Set up the part on parallels (why parallels are needed in this case, hammering to get the parallels to touch)
  + Zeroing on the top of the part (running RPM ~1200 - again the calculator will give you a similar number - , touchdown to make a small chip then put the diameter into the DRO)
* Machining the part
  + First flat\* (explain they will not get all material in one go, set the quill stop, same roughing and finishing pass depths as on the lathe) This is a good place for questions when cleaning the vise for the second flat
  + Second flat\* (set up with the first flat against the vise, make this one look rough and show that the cutter doesn’t care what way it cuts)
  + Brining the part down to length\* (zero by making a chip and entering the measured length into the DRO, do a final spring pass, explain why we climb mill and the difference between conventional and climb)
  + Edge finding (in drill chuck or collet, 0.5 diameter edge finder in green box, demonstrate on end of part and vise edge remembering to compensate for radius)
  + Drilling\* (peck drill to the correct depth, compensating for the tap lead in again)
  + Countersinking (run under 250 RPMs again)
  + Tap (insert dead center into drill chuck, slight pressure, 1.5 turns forward to 0.5 turns back)
  + Use a file to deburr

Final look over

* Go over surface finishes and countersinks
* Measure the part that was made (specifically the parallel trick)
* How they can make reservations (online at the COE Student Shop web page, going to want ~2 hours on each machine and leave about 15 min for cleanup)
* How to check stuff out (differences in green, yellow, and white slips)
* Where they can find the videos
* Emphasize that we are here to help
* Go over how they will be graded (make sure they measure their own part before turning in)
* Make sure they know they have to finish the part even if they think they already failed

**Red Permit**

1. Give them a small break then regroup
2. Show the first half of the video
3. Have the class lay out their part
4. Watch the rest of the video
5. Let them fabricate their parts