



Provisional PI Checklist

Name: _____

Version 7.1 (Spring 2023)

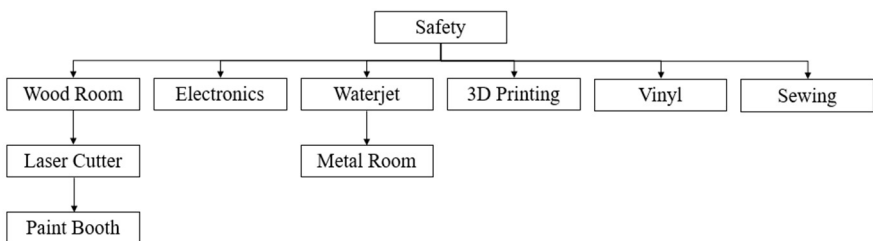
Instructions:



- Read this webpage: <https://inventionstudio.gatech.edu/become-a-pi/>
- Ask an Invention Studio Prototyping Instructor (called a PI) to train you on each category of equipment, and after you are trained, get checked off on your checklist.
- Wait at least 24 hours, and then come back and ask a full PI (yellow/green armband) to test you on a category of equipment. The same PI who trained you on a section cannot administer that section's test. You can't use notes on your test! A blank checklist has all the information you will need. For the test, you should know the tool well enough to train another user - take time to learn the tool if needed!
- After successfully completing all categories, turn in your checklist. There is a box at the front desk. The Director of Operations will contact you to schedule an interview.

General Testing Notes:

- Certain sections **must be completed in order!** Here are the rooms that must be completed sequentially:
 - Safety section must be completed first.
 - For the wooden trophy:
 - a. Wood Room
 - b. Laser
 - c. Paint Booth
 - For the metal box:
 - a. Waterjet
 - b. Metal Room



- If you fail a section, **don't worry!** The PI will provide retraining. Return after 24 hours to reattempt the section. Think of it as a canvas quiz with multiple attempts, not a final exam!
- **DO NOT LEAVE A MESS.** You must take your parts home with you and clean up.

Disclaimer: The completion of this checklist does not guarantee that you will be hired as an Invention Studio Prototyping Instructor.

Name: _____

SCC Team: _____

GTID: _____

GT Email: _____

Reason for completing Checklist (circle):

Major: _____

Become a PI or Limited SCC Access

Section		ISPI Name (Print)	Date	Notes
Safety (MUST COMPLETE FIRST)	Trained			
	Retrained			
	Completed			
Wood Room	Trained			
	Retrained			
	Completed			
Laser	Trained			
	Retrained			
	Completed			
Paint Booth	Trained			
	Retrained			
	Completed			
Electronics	Trained			
	Retrained			
	Completed			
Waterjet	Trained			
	Retrained			
	Completed			
Metal Room	Trained			
	Retrained			
	Completed			
3D Printer	Trained			
	Retrained			
	Completed			
Craffland (Vinyl Cutter)	Trained			
	Retrained			
	Completed			
Craffland (Sewing)	Trained			
	Retrained			
	Completed			

Safety

Note: This section must be completed before any other sections.

1. Point out where the fire extinguisher, first aid kit, eye wash stations/showers, and emergency exit are in the Hub and the Metal Shop.
2. Open a first aid kit and describe the uses of at least three items found inside.
3. Explain and demonstrate what steps must be taken to safely extinguish a laser cutter fire.
4. Explain what steps must be taken to safely extinguish an electrical fire.
5. Point out where the fire extinguisher and first aid kit are in the Wood Room.
6. Explain what should be done when the fire alarm goes off.
7. Explain the four Tool Safety Categories and give examples of each across various rooms.

a. The safety categories can be found at

"<http://www.safety.me.gatech.edu/toolcategories>"



8. Describe how a user can determine what materials are acceptable to use with a certain set of tools (Laser cutter, wood room tools, etc.). Explain what should be done if a user is found using a prohibited material or misusing a tool in any way.
9. Explain what PPE/clothing is required for different regions of the studio.
10. Describe which chemicals in the studio are toxic and what precautions should be taken when handling and disposing them.
11. Describe how to handle major and minor injuries.
12. Explain how to address users when they are doing something in an unsafe manner.
13. Describe how to report an incident using the incident report form. Explain who should be contacted following an emergency incident.
14. Explain what should be done during a tornado warning.

Wood Room

1. From the checklist materials drawer retrieve a 13" long 2x4 board and a 14" x 14"

plywood sheet. Note, these are rough dimensions and subject to error.

2. Explain to a PI the process of milling wood to be "Four-Square".
3. Show how to turn the ventilation on (including vents for each machine).
4. Using the jointer, joint a face and an edge of the 2x4 board so that you end up with the two surfaces flat and perpendicular to each other.
5. Explain to a PI the correct direction to send wood through the planer to minimize tear-out.
6. Use the planer to plane down the opposite face of the 2x4 board to 1¼" thickness. Now you should have two faces flat and parallel to each other, and a finalized thickness.
7. Explain what causes kickback on the table saw and how to avoid it. Also explain where it is safest to stand.
8. Using the table saw, perform a rip cut so that you end up with a 3" wide board. You should now have a four-square board with the dimensions 1¼" x 3" x 13".
9. Using the miter saw, cut an 8" long piece from your board. Make sure to **square both ends**.
10. Using the table saw again, cut a 10" x 7" piece of plywood from your 14"x14" plywood sheet stock.
11. Use the bandsaw to cut a 5" x 3 ¼" plate from an offcut of the previous step.
12. Use the drill press and a 3/32" drill bit to drill two holes in the 5" x 3 ¼" plate at the coordinates (1 ¾", 1 ⅝") and (3 ¼", 1 ⅝").
13. Use one of the mounted sanders to round the corners of the plate.
14. Show how to turn the ventilation off.
15. Use the orbital sander, working your way up from 120 grit to 320 grit, to smooth your 8" board.
16. Use the air hose to clean off dust from parts.
17. Vacuum and clean the area you worked in.
18. Show a PI the following parts to be signed off.
 - a. 10"x 7" plywood sheet
 - b. 3 ¼ " x 5" plate with holes and sanded
 - c. 1 ¼ " x 3" x 8" planed and sanded board (Faces will be checked for squareness)
 - d. A clean workspace

Laser

Note: Before you start the Laser Test you MUST complete the Wood Room Test.

Part 1: Inkscape Setup

Item #1: GT

1. Using Inkscape, import the file IS_laserchecklist_GT.png from checklist files.
2. Trace the image and remove everything except the outline of a single GT (hint, the node tool is your friend).
3. Resize the GT so that its overall dimensions are 9" x 5.75".
4. Move the GT so the bottom left corner is at the origin.
5. Remove the fill and set a red stroke for the GT.
6. Place 0.15" diameter circles at (5",1.5") and (5",3") to be cut out.

Item #2: Guide

1. Open a new document and import the 3"x2" rectangular guide, "Guide.dxf." Show the PI on duty the correct manual scale factor and remove all the SolidWorks text.
2. Select the lines and combine the nodes to form a single rectangle (not 4 individual lines from .dxf file).
3. Convert the rectangle to a path to be engraved (there should be no stroke) .
4. Insert your Name, Major, Class of 20xx inside the guide. (Make sure that the font is small enough to fit all the necessary text), ensure it is properly centered within the rectangle.
5. Show the PI the items before moving on to Part 2. If approved, send the files to JobControl.

Part 2: Laser Operation

1. Show a PI on duty how to turn on and off the laser and how to focus the lens.
 - a. Demonstrate using both auto focus and the focus tool.
2. Demonstrate to a PI how to upload your Inkscape files to Job Control.
3. Explain to a PI how to navigate Job Control to perform a laser operation.
4. For item #1: Use the 10"x7" plywood from the Wood room test to cut out the GT and

holes.

5. For item #2: Engrave both the text AND guide somewhere legible up the 2x4 from the wood section (ensure the GT cutout won't cover the engraving when assembled).
6. Show the following parts to a PI to be signed off:
 - a. GT cutout
 - b. Engraved 2x4

Paint Booth

Note: Before you start the Paint Booth Test you MUST complete the Laser Test.

In Wood Room:

1. Explain the different applications of the impact driver versus the regular drill.
2. Countersink the holes in the GT and base plate.
3. Use powered hand tools to attach the GT to 2x4 using #6 x1" wood screws.
 - a. Explain what pilot holes are & why they are used, and use them to aid in your trophy construction
 - b. The top left corner of the T should be flush with the top left corner of the 2x4.
 - c. Use powered hand tools to attach the base plate to the 2x4.
 - d. There should be a 1" border around the base of the 2x4.
4. Show the completed part to a PI to be signed off.

In Hub:

1. Demonstrate how to properly check out supplies for use in the paint booth.
2. Demonstrate how to prepare a new can of spray paint for use
3. Select an appropriate can of clear coat for the job. You may also want a pair of latex gloves.

In Paint Booth:

4. Demonstrate how to properly turn on and off the vents and lights. Explain when the vents and lights should be on.
5. Demonstrate how to properly sign-in to the paint booth.

6. Explain when the doors of the paint booth should be opened or closed.
7. Demonstrate how to properly put on a respirator. Explain when a respirator is to be used in the paint booth. (Are there any conditions in which a user can refuse to wear a respirator?)
8. Using proper technique, apply a clear coat to your part.
9. Demonstrate how to properly store your piece for drying and how to fill out a Parking Pass.
10. Demonstrate how to properly sign out of the paint booth
11. Explain the state in which the paint booth is to be left
12. In the event that a can of spray paint runs out, explain to the PI what must be done
13. Demonstrate how to properly close the door to the paint booth.
14. Return the supplies to the proper section in the paint supply cabinet and retrieve your Buzzcard.
15. Let your part dry.
16. Retrieve your trophy! Abandoned trophies will be thrown away.

Electronics

1. Find and set aside an LED, 330-ohm resistor, 2 different color spools of wire, a few jumper cables, a spool of solder, a breadboard, and a protoboard.
2. Explain the differences between solid and stranded wire and when to use them.
3. Set up the circuit on the breadboard; use two male-to-male jumper cables, one for the positive side and the other for the negative side, to serve as attachment points to test the circuit.
4. Configure the power supply to 3 volts, making sure the current limit isn't too low, and connect it to your circuit. Make sure the LED turns on.
5. Once you are sure the breadboard circuit works, cut a two-inch length of wire from each spool to use as power connection leads to the protoboard circuit. Strip both wires at both ends.
6. Transfer the components to the protoboard (replacing the jumper cables with the prepared wires), lining them up in the manner you want to solder them in place.
7. Explain why the soldering iron tip oxidizes, how to tin the tip, and how often to do so.

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8. Explain the difference between leaded and unleaded solder.
9. Put on your safety glasses and explain their purpose while soldering.
10. Turn on one of the ventilation systems and explain the purpose of ventilation.
11. Turn on the soldering iron, explain why we use different iron temperatures, and set the iron to the correct temperature for the solder in use.
12. Paying attention to polarity, solder the components to the board, tinning the iron frequently.
13. Next, use the bridging technique to connect the legs of the necessary components together with solder to complete the circuit.
14. Tin the iron and turn it off.
15. Using the same power supply configuration as before, power your board and demonstrate the lit LED to a PI.
16. Explain both methods of desoldering (solder sucker and wick).
17. Turn the soldering iron back on and desolder all parts from your board using your preferred method; clear any solder-filled holes with the solder sucker.
18. Tin the iron, turn it off, return the breadboard and protoboard, and return any cords and jumper cables; the LED, resistor, and power wires can be discarded.
19. Explain a few of the most common ways users damage our soldering iron tips.
20. Show the cleared protoboard to a PI to be signed off.
21. Wash your hands!

Note: Help document for PIs can be found in the general channel.

Waterjet

1. Demonstrate waterjet startup
2. Demonstrate how to clear pump faults and movement faults, explain how to tell if there is a fault.
3. Open the IS_waterjetchecklist.dxf on the waterjet computer, the DXF file should be in inches.
4. Prepare the file for cutting. Use tabs for both parts. Make sure the parts are positioned to minimize waste area.

5. Export to OMAX Make and set proper material settings. Explain what type of materials can be cut on the water jet.
6. Demonstrate usage of ballast tanks and explain how to rectify the situation when water level cannot be lowered sufficiently.
7. Secure the material in the waterjet using an appropriate method for the sheet you are cutting. **Note: The material you are cutting is thin, so be careful on how you clamp it so it doesn't bow or shift during cutting. If this happens, your cut was not successful.**
8. Demonstrate how to home the machine.
9. Explain why it is important to set the z-axis zero correctly.
10. Set path start and zero the x-axis, y-axis, and z-axis appropriately. Keeping in mind the following:
 - a. The z-axis zero point should be the highest spot on the cut area.
 - b. Make sure that your cut doesn't go off the edge or collide with any weights or clamps.
 - c. reduce the amount of material wasted by locating your piece near previous cuts.
11. Demonstrate how to go to a point along the cutting path.
12. Explain why it is important to home the machine before cutting.
13. Cut out the part. When finished, record your information and the pump hours in the log.
14. Turn off machine and explain why it is important to do so
15. Keep both parts. They will be used to complete the metal room checklist.
16. Show the finished parts to a PI to be signed off.

Metal Room

Note: You MUST complete the Waterjet Test before you can begin Metal Test.

1. Use shears to remove the extra flange on one side of the large plate. After you do this, all four sides will be the same height.
2. Remove tabs and deburr the edges using a belt sander.
3. Place the smaller GT plate on the center of the larger plate. Use a center punch to

- mark the locations of the two holes in the GT plate on the larger plate.
4. Demonstrate how to change the speed on the drill press and explain how to select an appropriate speed.
 5. Use the drill press and an appropriately sized drill bit to create holes for a $\frac{1}{8}$ " diameter rivet (provided). Drill these holes where you marked them.
 6. Using the sheet metal brake, bend all four sides of the large plate into a box.
 7. Use two rivets to fasten the GT plate to the inside of the box. Use the $\frac{1}{8}$ " rivets that are provided.
 8. Clean up your workspace.
 9. Show the finished box to a PI to be signed off.

3D Printer

1. Show the PI on duty the location of each type of printer (Ultimaker 3/S3, Ultimaker S5, Form 3/3L, Markforged Mark Two) and briefly describe what each type of printer should and should not be used for.
2. Describe how a user can have a part printed on the professional printers (Stratasys Dimension 1200ES/EOS Formiga P110).
3. Demonstrate changing filament on an Ultimaker.
4. Explain the purpose of glue and when it should be reapplied to the glass plate.
5. Tell the PI on duty what file type is input to Cura, and what file type is sent to the printers.
6. Open Puzzle.stl and Skull.stl on the same build-plate, explain to the PI on duty which parts require support, and how to exclude certain areas from using supports.
7. Open ditto.stl.
8. Scale the Ditto to 25%.
9. Explain Layer Height, Infill Density, and Wall Thickness, and state their recommended ranges.
10. Explain what a brim is and what types of parts it should be used for. Demonstrate enabling the brim setting.
11. Select a profile with a 0.2 mm layer height (e.g., "Standard+"), and then set infill density to 0% and wall thickness to 0.8 mm and disable supports.

12. Slice the Ditto and upload the prepared G-code file to your own 3DPrinterOS account.
13. Explain when it is necessary to abort a print and how to abort.
14. Add your print to the Fleet Printers queue and demonstrate how to start a print using the PI's 3DPrinterOS account.
15. Demonstrate how to properly remove a finished print.
16. Show the printed Ditto to a PI to be signed off.

Craftland

Vinyl Cutter

1. From the vinyl drawer, retrieve two colors of vinyl and the vinyl cutter mat.
2. Open Silhouette Studio and create a new blank file. In page setup, select the correct machine model and mat type for the machine currently being used. Additionally, explain which machine models and mat sizes are available in Craftland.
3. Import the file IS_CraftlandChecklist_png which is located on the desktop.
4. Resize the image to have a width of 5".
5. Trace the image by using 'Area Trace' function to create a vector file*
6. Delete the image and retain the vector file.
7. Separate the path into (1) the outline of the overall shape and (2) everything else such that (1) and (2) can be cut on separate pieces of vinyl.*
8. Show a PI your prepared file.
9. Show how to specify the material type being sent to the vinyl cutter. Explain what materials can be cut by the machine with the auto-blade insert and which of those materials are supplied in Craftland.
10. Cut out both colors of the design.
11. Use transfer tape to layer the top path over the bottom path.
12. Either trim the unneeded transfer tape or remove the transfer tape. Explain in what situations you might trim the transfer tape vs. remove it.
13. Show your sticker to a PI to be signed off.

**This step could be accomplished in multiple different ways.*

Sewing

1. Locate a fat quarter of solid-colored fabric, a fat quarter of patterned fabric, and the box of Poly-fill.
2. Iron the fat quarters to remove any wrinkles in the fabric.
3. Using Tailor's Chalk and a ruler, mark off a 6"x6" (15.25 cm x 15.25 cm) square of each of your two fabrics.
4. Identify fabric scissors from general purpose scissors. Use the pinking shears to cut the two 6" x 6" (15.25 cm x 15.25 cm) squares out.
5. Pin the squares together with the "right sides" of the fabric facing each other.
6. Mark a ¼" (.6 cm) seam allowance around the edges of the fabric.
7. Explain the purpose of the different threads and which to use for sewing.
8. Demonstrate the proper way to wind a bobbin to a PI. (If there are no empty bobbins available, explain the process.)
9. Demonstrate the proper way to thread the sewing machine to a PI.
10. Check sewing settings (tension, length, width, etc.)
11. Use a straight stitch to hem the pillow along the seam allowance, leaving about a 2" gap at the end. (Remember to start and stop with a reverse/locking stitch. You must pivot at the corners. Once finished, turn the dial until the thread take-up lever is fully raised before removing fabric.)
12. Trim the corners using fabric scissors.
13. Flip the pillow inside out through the gap.
14. Stuff the pillow with Poly-fill.
15. Use a ladder stitch to close the 2" gap.
16. Show your pillow to a PI to be signed off.