



DST PRAYAS SHALA AT KIIT-TBI

STANDARD OPERATING PROCEDURE



www.kiitincubator.in

Campus-11, KIIT Deemed to be University, Bhubaneswar-24

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General Information

Prayas Shala at KIIT-TBI (or the KIIT-TBI Fablab) is a Department of Science and Technology (DST), GoI, supported state-of-the-art digital fabrication lab facility providing an integrated platform for rapid prototyping, product design and technology development. Set up with the support of the DST Nidhi Prayas Programme, this 4000 square feet facility houses a high precision laser cutting machine, a CNC router, 3D printers, advance electronics assembly, wood working and power tools, PCB design and fabrication machine and many other tools and equipment. Employing the aforementioned facilities, entrepreneurs and innovators can churn out acrylic-based, glass-based and wood-based prototypes with ease. They can make anything and everything based on MIT's popular concept of Fablab.

Under Prayas Shala the Fablab Academy is an initiative that will facilitate a cross learning culture among multiple technology sectors and create a robust platform for the budding young entrepreneurs to create technology driven indigenous products.

Objective

The objective of KIIT-TBI Fablab is to encourage the innovation, idea realization, technology development, product prototyping, and commercializable product development. This will empower the user entrepreneurial culture. The Fab Lab Academy will lead to a cross learning culture among multiple technology sectors and create a robust platform for the upcoming entrepreneurs to create indigenous technology products.

Scope

The KIIT-TBI Fablab are a support facility for the user community comprising of startups, entrepreneurs, corporate, individual makers, research groups, academic institutions and universities across India. The KIIT-TBI Fablab Academy has a vibrant ecosystem for creating a maker culture among the young techno-entrepreneurs, who want to develop their innovative technology idea into product prototypes with fine design functionalities. This Fablab is open to all the Members, who wish to become more familiar with digital fabrication and to network with international Fablab communities.

Who is it for?

KIIT-TBI Fablab is open for students, professionals, lifelong learners with backgrounds from all kinds of disciplines looking for new approaches or to broaden the scope of their practice. We welcome individuals from every walk of life - with or without experience in technical training, whether it's looking for a way to develop a specific project or pursue the physical aspects of an idea.

KIIT-TBI Fablab Academy consists of technical training but also the creative freedom to develop projects with an analytical and logical approach alongside practical design experience. Students will become acquainted with industry standards; latest innovation trends and participate in a booming ecosystem of young scientists and entrepreneurs. Fab Academy is an inspiring creative technical environment in which designers and scientist collaborate, looking to create the maximum positive impact for the planet.

Guests and Visitors

Any individual who has completed the requirements for access may accompany lab guests and visitors. He or she is responsible for that guest. Guests and visitors are not permitted to use any machines or tools and are not allowed in the machine use areas. Visits must be scheduled and approved by the competent authority. Visits should be as brief as possible. Visitor must follow all the guidelines issued by KIIT-TBI.

Facilities

1. 3D Printing
 - Ulimaker 3
 - Ultimaker 3 Extended
2. PCB Design and Prototyping
 - LPKF PROTOMAT S-63
3. CNC Routing & CNC Milling
4. Laser Cutting and Engraving
 - TORMACH 4TH AXIS
5. Woodworking & Power Tools
6. Advance tools & Metrology Set & PCB Tools
7. Vinyl Cutting
8. 3D Scanning
9. Advance Electronics Lab
 - MDO Oscilloscope
 - Electronic Sub module: Micro controller & AM
 - Digital Storage Oscilloscope (2) + Triple Channel Power Supply (3)
10. PXI Based Data Acquisition System
11. Programming Environment

Standard Pricing

Sl.No	Facility	Usage Charges (in INR)	Material/Component Charges (in INR)
1	FDM 3D Printing	150/hr	6.50
2	Laser Cutting	12/min for Acrylic, Paper, Wood Cutting and MDF Engraving	As per actual
3	CNC 2D /3D Metal Machining	350-400/hr depending on materials like Aluminium, Iron, SS, MS	As per actual
4	CNC Routing MDF for 2D Cutting	2-6 mm: 10 /Sq.ft, 8 -10 mm: 12-15/ Sq.ft, 12- 20 mm: 15-20/sq.ft	Price range may vary due to complexity of design or bulk order of material
5	PCB Prototyping	50/ 1 sq.inch for single side, 70/ 1 sq.inch for double side	As per actual
6	Vinyl Cutting	10/min	As per actual
7	CAD Modelling	200/hr for 2D, 500/hr for 3D	As per actual
8	Designing in Photoshop & Illustrator	100/hr	---
9	PCB Designing	50/Single Side,75/Double Side (Per Sq.inch)	---
10	Woodworking, Electronics testing & soldering equipment and other Tools Access	100/hr (For Non-Incubatees)	---

Policies and Procedures

1. The safety of the people using Fablab is a principal consideration. It is essential that Lab coordinator, Technical engineer and Technology Innovation fellows take an active part in initiating preventive measures to control hazards associated with activities under their direction.
2. Safety is an integral part of all programs in which there is a risk of injury or health in the academic, research and service areas.
3. The rules and guidelines in this document apply to the entire Fablab area including the patio accessed by the garage doors and any other lab related work environment.
4. Follow the COVID-19 guidelines strictly.
5. All tools must remain in the Fabrication Lab at all times and may NOT be checked out.
6. At no point will tools will be allowed outside of the lab and its adjacent support areas.
7. The general Fablab guidelines will be applicable to every person using the Fablab.

Special Attention/Personal Needs

The KIIT-TBI Fablab requires any user with a medical condition to consult with their personal physician prior to using the Lab.

Please inform the in-charge immediately if you are sensitive to the following or have issues with any of the following:

1. It will be your responsibility to inform the in-charge, on duty each time you enter the Lab
2. Dust allergies
3. Latex allergies
4. Any other allergies that may be present.
5. Physical contact with your in-charge. (If they notice you working improperly, they may physically move you for guidance or safety purposes.)
6. Loud background noises and/or commotion caused by machines.
7. Any type of COVID-19 Symptoms
8. Any other need that may require special attention.

KIIT-TBI Fablab can be accessed for the following THREE activities:

1. Visit to KIIT-TBI Fablab facility
2. To use machines or equipment for prototyping/ digital fabrication
3. To participate in certification courses, Hands-On Trainings and Workshops.

General Guidelines for KIIT-TBI Fablab

Registration & Online Booking

1. The applicant/applicants have to first login into www.kiitincubator.in and register an online-application before 48 hours of accessing the facility.
2. After logging in, the applicant has to create a profile and upload proofs of Identity (Identity Proof Organizational /Institutional /Employee Identity /Student Identity/ Personal Identity in case of a maker or entrepreneur).
3. The Candidate/Candidates must provide all the required data with detailed and correct information.
4. Providing forge information can cause a life time ban from using KIIT-TBI Fablab.
5. Instant request to accesses the facility may be considered subject to availability.
6. Entry into Lab. Is completely provisional the in-charge has all rights to allow the access to the facility.
7. The registered applicants have to submit the receipt of online registration at the reception/to the in-charge for accessing the Fablab facility and they will be provided with individual access cards.
8. The users can only enter the facility by swiping their own access cards, and no tail gating is allowed.

Membership

KIIT-TBI will issue membership cards for the users (Corporate/ Institutions/ Individuals) for availing the Membership Offerings.

One has to apply online for availing the membership card and the member will be given preferences, while blocking the time slots.

Machine Usage

The machines will be allotted on availability basis and the users will be charged on machine usage on an hourly basis. Any overrun in work from the time slot allocated will be charged extra. The usage charge is fixed by KIIT-TBI and getting revised time-to-time. Members, Bulk Order Supply may enjoy special pricing subject to approval of competent authority.

Consumables

The applicant/member should communicate KIIT-TBI Fablab, about the consumables required from the store at the time of registration. The consumables will be provided by KIIT-TBI on availability and it will be charged on consumption basis. We allow the applicant to bring in additional consumable, and it should be properly informed to Fablab In-Charge for verification.

Working Hours

- The KIIT-TBI Fablab working hours will be 9 hours a day starting from 10.00 am to 7.00 pm (Monday to Saturday).
- The time slot and working days is flexible based on request. Lab access may be limited during peak times.
- Any member who accesses the Fablab must fill out a record/ logbook to mark the usage timings.

Safety Measures

1. The user of KIIT-TBI Fablab should strictly abide with the guidelines/ safety measures instructed by the Fablab In-charge.
2. Safety in the Fabrication Lab is the highest priority. Accidents may result in serious bodily harm or death.
3. Following proper safety procedures and conforming to the Fabrication Lab policies outline hereunder will greatly reduce any chance of injury.
4. Do not experiment with the tools or try to figure out how to use a machine on your own.
5. If you do not use a tool or machine exactly how you have been shown or neglect to follow all safety rules, severe injury could result.

Fab Lab Use and Safety Training

In order to use the fabrication lab, users must attend Safety Use and Orientation Training which will be delivered by the Fablab in-charge. Any user entering the fabrication lab will be required to verify they have completed all required safety training.

First-aid Box

The lab should keep first aid boxes with general items like cloth bandages, cotton, bandages, sterilizers, spirit, relieving sprays or ointments, creams or ointments for injury and burning. This would help one to take immediate medication or before rushing to a medical centre.

Personal Protection

It is advised that the user should strictly wear respective Personal Protection Equipments recommended for each machine. There are several measures you must take to protect yourself from work hazards.

1. Do not wear loose fitting clothing
2. Do not wear neckties
3. No jewelry should be worn in the fabrication lab, which could interfere with the working in the lab. (Including earrings, watches and rings)
4. Snug fitting clothing is essential to your safety
5. Make certain that long hair is not loose, but is pulled back away from equipment.
6. Always wear safety glasses when working with any lab equipment. Additional protection using goggles or face shields may be necessary for work such as grinding, chiseling or chipping.
7. Notify your supervisor/professor if you notice any unsafe work conditions.
8. Inform other staffs if you see an unsafe work practice; however, be careful not to distract a person who is working with power tools.

Safety Guidelines

Follow these guidelines for general work safety:

1. Never work alone. There must always be at least one Fablab –person to be present in the fabrication lab.
2. Always wear appropriate safety gear and protective clothing, including shoes and mask.
3. Eye protection is required while operating any machine.
4. Know where the fire extinguishers are located and how to use them.
5. Never work impaired. This also does not simply mean impaired from drugs or alcohol, but also from sleep deprivation.
6. Know the hazards associated with your work. Be sure you are fully educated on the proper use and operation of any tool before beginning a job. If you cannot do a job safely in the fabrication lab, don't do it. Think through the entire job before starting.
6. If you are unsure about how to safely execute the operation of a tool, ask for help. Have the lab in-charge assist, demonstrate, and observe to help you become familiar and comfortable.
7. If you have not worked with a specific material before, consult the lab in-charge for precautions, methods and instruction prior to beginning work.
8. Do not work in the lab if you are in a hurry, this almost always ruins the work and often results in injury.
9. Leave tool and equipment guards in place. This is especially true with the table saw. The guard with the anti-kickback device should always be on the saw unless the operation is not possible with it in place.
10. Before starting any machine be sure to check that it is set up correctly and fully operational.
11. Check power cords and plugs on portable tools before using them.
12. Use a brush, or special tool for the removal of chips, shavings and debris. Do not use your hands to clean shavings or cuttings – they can be sharp and cause injury.
13. When doing heavy sanding face masks or respirators should always be worn.
14. Keep your fingers clear from the point of operation of machines by using special tools and devices such as push sticks and paddles. Never use a rag near moving machinery.
15. Keep the work area free from debris, clean spills immediately and remove all sawdust and wood chips. Do not bring food or drink in to the fabrication lab.
16. Clean up after yourself. Before you leave the lab be sure all tools are returned to their appropriate position and all the machines are clean and the floor is swept. Allow a minimum of 10-15 minutes for your clean up procedure.
17. Earphones, cell phone use and texting are not allowed in the Lab. We need to be able to get your attention and you need to hear what's going on around you.

Eye protection

Eye protection must be worn at all times while working in the Lab or space - Safety glasses are provided. Consistent failure to wear eye protection will result in loss of access.

Non- Injury Incidents

- In the event of accidents resulting in machine damage, material kick- back or other unsafe events, the following procedure must be followed:
- If gross negligence is determined to be involved in the course of a non- injury accident a meeting is required between the users and the KIIT-TBI Fablab in-charge before Lab or space access may resume.
- If an individual is consistently working in an unsafe manner his/her privileges will be revoked.

Injury causing Accidents

In the event of an injury-causing accident, the following procedures must be followed:

Notify the KIIT-TBI Fablab in-charge or person on duty immediately. Lab personnel will follow established first-aid procedures. All injury-causing accidents requiring outside medical attention requires a meeting with the KIIT-TBI Fablab in-charge to determine the cause of the accident and as a preventive measure against similar accidents in the future before Lab access may resume.

Storage of Materials and Projects

Storage of materials in the KIIT-TBI Fablab in-charge is prohibited. The lab is not responsible for any projects left unattended.

- Any project left overnight should have all necessary contact information. Projects left overnight must be retrieved by 10:00 am the following morning.
- Projects left for two week will be disposed of.

Cleaning of KIIT-TBI Fablab Facility

- Each user is responsible for clean-up and tool return.
- Machine and work area should be cleaned immediately after use.
- Machines should be blown off using the air hose and the floor area around it should be swept clean.
- The last person to use a machine is responsible for cleaning the machine and surrounding work area, users who consistently fail in their clean-up responsibilities will be denied Lab access.

Materials

- Tools and Machinery in the KIIT-TBI Fablab each have an intended use to specific materials. Please check with the Lab in-charge if you wish to work with unique materials in the Lab.
- Used wood and wood based materials may be processed in the Lab as long as the material is clean, free of dirt, grit, grime, metal, paint, varnishes, enamel, moisture or abrasive materials.
- Material that is excessively contaminated with any of the above will not be permitted.
- Lab users using used materials may be found liable for damage to the tools and equipment caused by those materials.

Hand tool Safety

- These tools, while they do not involve the same dangers as power machinery, should be used cautiously.
- The type of injury sustained while misusing these tools are small cuts and lacerations - sometimes requiring stitches.
- Please observe the following guidelines while using hand tools.
- Hand tools are non-powered tools. They include wrenches, hammers, chisels, screw drivers, and other hand-operated mechanisms.
- Even though hand tool injuries tend to be less severe than power tool injuries, hand tool injuries are more common. Because people take everyday hand tools for granted, simple precautions for safety are easily forgotten.
- Hand tools must remain in the Fabrication Lab at all times and may NOT be checked out.
- At no point will tools will be allowed outside of the lab and its adjacent support areas.

The most common hand tool accidents are caused by the following:

- Failure to use the right tool
- Failure to use a tool correctly
- Failure to keep edged tools sharp
- Failure to replace or repair a defective tool
- Failure to safely store tools

IMPORTANT: Use the right tool for the job to complete a job safely, quickly, and efficiently.

Follow these guidelines for general hand tool safety:

1. Wear safety glasses whenever you hammer or cut, especially when working with surfaces that chip or splinter.
 2. Do not use a screwdriver as a chisel. The tool can slip and cause a deep puncture wound.
 3. Do not use a chisel as a screwdriver. The tip of the chisel may break and cause an injury.
 4. Do not use a knife as a screwdriver. The blade can snap and cause an injury.
 5. Never carry a screwdriver or chisel in your pocket. If you fall the tool could cause a serious injury. Instead use a tool belt.
 6. Use the proper wrench to tighten or loosen nuts. Pliers can chew the corners off a nut and the pliers can become damaged.
 7. When using a chisel, always chip or cut away from yourself.
 8. Do not use a wrench if the jaws are sprung.
 9. Direct saw blades, knives, and other tools away from aisle areas, students and employees.
 10. Keep knives and scissors sharp. Dull tools are more dangerous than sharp tools.
- Improper tool storage is responsible for many Fablab accidents. Return each tool to its marked location for proper tool storage. Never use a dull tool - it is actually much more dangerous than a sharp one.
 - Think about the direction your energy is going while performing an operation.
 - If you are holding material in your hands, be sure the action is going away from your body.
 - Better yet, clamp the material in a vise or to the surface of a workbench. Like power tools, think through a procedure before you attempt it. Many times, we become complacent or are rushing through a job - that is when accidents are most likely to occur.

Hand-held Power Tools

Hand held power tools comprise of change blades, bits, etc., when the tool is off and unplugged. It is very easy to accidentally turn the tool on.

1. Know what direction it moves and be prepared to compensate for the torque of the motor.
2. Wear eye protection at all times - some tools such as the lathe may also require the use of a face shield.
3. Always keep your hands a safe distance from cutters and blades.
4. Make sure all guards and safety devices are in place.
5. Do not use a machine without the proper guards. Keep the machine clean.
6. Know the physics of the machine and where the cutting force wants to throw the material.
7. Make sure to turn all power tools off before unplugging, and always check that it is turned off before plugging in.
8. All hand held power tools must remain in the lab and may NOT be checked out. At no point will tools be allowed outside of the lab and its adjacent support areas.

Following are the reasons that may cause accidents:

1. Touching the cutting, drilling, or grinding components
2. Getting caught in moving parts
3. Suffering electrical shock due to improper grounding, equipment defects, or operator misuse
4. Being struck by particles that normally eject during operation
5. Touching hot tools or work-pieces
6. Falling in the work area
7. Being struck by falling tools

When working around power tools, you must wear personal protective equipment and avoid wearing loose clothing or jewellery that could catch in moving machinery.

In addition to general lab guidelines, follow these guidelines for working with power tools:

1. University employees or students shall not turn on, use, repair, or operate any machine, tool, equipment unless authorized by a fabrication lab supervisor.
2. Use the correct tool for the job. Do not use a tool or an attachment for something it was not designed to do.
3. Select the correct bit, blade, cutter, or grinder wheel for the material at hand. This precaution will reduce the chance for an accident and improve the quality of your work.
4. Keep all guards in place. Cover exposed belts, pulleys, gears, and shafts that could cause injury.
5. Always operate tools at the correct speed for the job at hand. Working too slowly can cause an accident just as easily as working too fast.
6. Watch your work when operating power tools. Stop working if something distracts you.
7. Do not rely on strength to perform an operation. The correct tool, blade, and method should not require excessive force. If undue force is necessary, you may be using the wrong tool or have a dull blade.
8. Before clearing jams or blockages on power tools, disconnect from power source. Do not use your hand to clear jams or blockages, use an appropriate tool.
9. Never reach over equipment while it is running.
10. Never disable or tamper with safety releases or other automatic switches.
11. When the chance for operator injury is great, use a push stick to move material through a machine.
12. Disconnect power tools before performing maintenance or changing components.
13. Keep a firm grip on portable power tools. These tools tend to "get away" from operators and can be difficult to control.
14. Never leave chuck key in chuck.
15. Keep bystanders away from moving machinery.
16. Do not operate power tools when you are sick, fatigued, or taking strong medication.
17. When possible, secure work pieces with a clamp or vise to free the hands and minimize the chance of injury. Use a jig for pieces that are unstable or do not lie flat.
18. Always work in a clean environment.

An unkempt work place can result in injury, especially when sawdust accumulates on concrete floors. You must always be responsible for cleaning up after yourself.

Machine Safety

- To operate a machine safely, you must know more than just how to turn it on and off.
- You must know how to perform the basic operations and how to make simple adjustments.
- Always maintain a healthy respect for the tool's capabilities and limits.
- Never use a machine for a job it was not designed for and never experiment - if you are unsure about how to perform a certain operation, ask for help.
- The more you know about a machine, the safer you will be.
- Don't become over confident - that leads to carelessness, which causes accidents.

The following are general guidelines for machines

1. Wear eye protection at all times - some tools may also require the use of a face shield.
2. Always keep your hands a safe distance from cutters and blades.
3. Make sure all guards and safety devices are in place and in perfect operating order. Do not use a machine without the proper guards.
4. Know the physics of the machine and where the cutting force wants to throw the material.
5. When feeding material through a machine with the hands, be aware of the direction you are pushing (away from blade or cutter)
6. 6. Never operate a power tool when alone in the Lab.
7. Defects in material can be dangerous. Check the stock carefully for knots, splits, and other defects.
8. Keep the machine clean. Remove all tools, lumber, and unnecessary materials. Objects left on the machine can vibrate into revolving cutters. They can then be thrown from the machine with great force. Never clean a machine while it is running.
9. Always work with a plan of procedure. Consider and think through each step ahead of time.
10. Never make an adjustment unless the power is off. The tool must come to a complete stop.
11. Your stance is also important - stand in a comfortable, balanced (defensive) position when working with power tools. Both feet should be firmly on the floor. If something doesn't sound right, or feel right - turn off the machine and inform the supervisor or monitor.
12. Above all, think before you perform any task. Know the tool's capabilities and the work it is intended for.
13. If you feel unsure, STOP and ask for assistance.

Procedures

KIIT-TBI Fablab has created this Operational Guidelines for the Fablab, which should be followed for the operation and maintenance of the facility. Any additions to the guidelines may be reviewed and corrected/ updated from KIIT-TBI Fablab authority from time to time.

Standard Operating Procedure of Some Critical Equipment

1. CNC Router

DO NOT use this machine unless someone instructed to you in its safe use and operation and has given permission.

Safety Measures

1. Safety glasses must be worn at all times in the work area
2. A Mask must be worn every time you enter into the Lab. Area.
3. Rings and jewellery must not be worn near moving machinery components.
4. Long and loose hair must be contained or restrained
5. Appropriate footwear with substantial uppers/Shoe must be worn.
6. Close fitting, protective clothing or a workshop apron is encouraged

Pre-operational Safety Check

1. Ensure you are familiar with CNC nesting and tool-pathing software functionality.
2. Locate & ensure you are familiar with the operation of the ON/OFF and emergency stop controls.
3. Ensure that the guard door and safety devices are in position and secured.
4. Only machine materials that are suitable for this routing process.
5. Ensure that the router cutting bit size conforms to specifications. The machine must be isolated while any adjustments are made to the cutter head of tool array.
6. Ensure all cutters are sharp and free of resin build-up or wear.
7. Adjust the waste collector shroud and coolant system correctly for maximum efficiency.
8. Be aware of any other personnel in the immediate vicinity and ensure the area is clear before using this equipment.
9. Familiarise yourself with all electrical and mechanical operations and controls, including any handheld keypad interface remote control.

Operational Safety Checks

1. Never attempt to program this CNC machine without proper training.
2. Never pre-program any CNC router to perform operations beyond the capacity of the machine.
3. Confirm all CNC programming instructions for the router.
4. Ensure the work piece is securely held flat to the vacuum pads within the machine.
5. Ensure that the tool bit array tracking remains unobstructed during the routing operation.
6. Never leave the CNC router in operational mode while unattended.

Housekeeping

On completion, isolate the switches. Leave the machine in a tidy, clean and safe manner.

Potential Hazards

***Impact, pinch and crush points
Entanglement and entrapment
Failure or malfunction***

***Dusts and fumes
Eye injury***

***Electrical components
Control errors Manual handling***

2. CNC Laser Engraver

DO NOT use this machine unless someone instructed to you in its safe use and operation and has given permission.

Safety Measures

1. Safety glasses must be worn at all times in the work area
2. A Mask must be worn every time you enter into the Lab. Area.
3. Rings and jewellery must not be worn near moving machinery components.
4. Long and loose hair must be contained or restrained
5. Appropriate footwear with substantial uppers/Shoe must be worn.
6. Close fitting, protective clothing or a workshop apron is encouraged

Pre-operational Safety Check

1. Ensure that materials and coating to be cut pose no hazard. Consult the manufacturers' SDS.
2. Only a trained and competent person should be setting up and operating this equipment.
3. Safety guarding and magnetic lockout devices must never be removed or adjusted.
4. It is mandatory that an exhaust extraction system is attached to an operational laser cutter.
5. Visually check the area to ensure no slip or trip hazards are present in this workspace.
6. Be aware of other students and staff that may be in the immediate vicinity.

Operational Safety Checks

1. Never attempt to program this CNC machine without proper training.
 2. Connect to your computer with either an Ethernet cable or USB cable – but not both.
 3. Turn on the power to the laser and wait for a 'beep' to note the machine is initialized.
 4. Turn on the exhaust on the fume extraction system.
 5. Place your material on the table in the upper left corner – ensure the table is set low enough.
 6. Manually focus – or set Auto-Focus button to 'YES'.
 7. Close the safety guard door (lid or cover) before operations can commence.
 8. From the dashboard control, set the speed and power, etc. for the material you are using.
 9. Your print job appears in the LCD display. To run the job, press 'Go' on the keyboard.
 10. The carriage will move from its park position to the point of first engraving or cutting.
- The process is now automatic until all passes are complete.

Housekeeping

1. Turn the CNC laser engraver/cutter and fume extractor off after use.
2. Regularly service and check the laser cutter for operational faults.
3. Always leave the grid and table tray clean and free of residue and debris.

Potential Hazards

***Impact, pinch and crush points
Entanglement and entrapment
Failure or malfunction***

***Dusts and fumes
Eye injury***

***Electrical components
Control errors Manual handling***

3. 3D Printer

DO NOT use this machine unless someone instructed to you in its safe use and operation and has given permission.

Safety Measures

1. Safety glasses must be worn at all times in the work area
2. A Mask must be worn every time you enter into the Lab. Area.
3. Rings and jewellery must not be worn near moving machinery components.
4. Long and loose hair must be contained or restrained
5. Appropriate footwear with substantial uppers/Shoe must be worn.
6. Close fitting, protective clothing or a workshop apron is encouraged

Pre-operational Safety Check

1. Move the print head as far from the table as practical
2. If the print head is hot, wear heat resistant gloves
3. Unclip the build sheet from the printer's table taking care not to contact the print head
4. Take the build sheet away from the printer
5. Bend the build sheet gently with fingers to see if you can get the print to break away
6. If bending doesn't work, place the build sheet on the bench against the wooden stop
7. Keeping hands behind the cutting edge, work against the stop and use the supplied sharpened spatula or the chisel to pry under the print to separate it from the build sheet.

Operational Safety Checks

1. If glass plate appears dusty, dirty, or otherwise needs cleaning.
2. Turn on the Ultimaker2 by flipping the switch on the back, left-hand side of the machine.
3. Insert the SD card into the Ultimaker2 SD card slot on the front of the machine (may already be loaded).
4. Select "Print" from the main screen on the printer by rotating the wheel on the front, and pressing in on the center to select an option.
5. Scroll through the available models to find and select yours. The length of polymer filament required and print time should be displayed by each model.
6. The printer will then begin heating up the nozzle. A progress bar will be shown on the printer screen.
7. When the print is done, the printer will start cooling down. Temperatures of the nozzle and the build-plate will be displayed on the screen.
8. The screen will read "Print finished. You can remove the print." when the print is ready to be removed from the build-plate. DO NOT remove the print until then.
9. Remove any excess polymer strands that may be on the plate and throw them away.
10. Turn off the Ultimaker2 by flipping the switch in the back left-hand side of the machine.

Housekeeping

1. Clear the nozzle when switching filaments
2. Use clean filament only
3. Brushing the Nozzle Externally
4. Soak the Nozzle in Acetone

Potential Hazards

***Impact, pinch and crush points
Entanglement and entrapment
Failure or malfunction***

***Dusts and fumes
Eye injury***

***Electrical components
Control errors Manual handling***

4. PCB Prototyping Machine

DO NOT use this machine unless someone instructed you in its safe use and operation and has given permission.

Safety Measures

1. Safety glasses must be worn at all times in the work area
2. A Mask must be worn every time you enter the Lab. Area.
3. Rings and jewellery must not be worn near moving machinery components.
4. Long and loose hair must be contained or restrained
5. Appropriate footwear with substantial uppers/Shoe must be worn.
6. Close fitting, protective clothing or a workshop apron is encouraged

Pre-operational Safety Check

1. The device is switched off.
2. All the plugs and pins are properly connected
3. Keep the raw material ready for PCB Fabrication
4. The device area needs to be properly clean

Operational Safety Check

1. Make sure the device is not producing unnecessary noise while switched ON.
2. The Device is well connected with the Controller PC.
3. Please look for the expert advice before using the device.
4. Log in to the Controller PC
5. Turn on the S63 (Open the machine cover, the power switch is on the bottom right front corner)
6. Close the Machine Cover
7. Prepare backing surface: The white backing material must be as smooth and flat as possible. This machine has no idea where the material surface is, beyond what the user tells it. That is, it thinks it knows the height of the top of your blank, but it assumes it is a perfect plane. If it deviates even by 2 mils (.05mm), isolation will not work. So, with the PCB blank not mounted, run your fingers over the surface of the white backing material and feel for any bumps or debris. If you feel any, blow off the debris or use the razor blade tool to remove the bumps. Bumps occur because drills and routing bits grind out and lift backing material. This is especially noticeable in the routed grooves where a PCB was separated from the blank. It's a good idea to run the razor blade over the surface even if you can't feel any bumps. Lift the white backing material out and check the backside too.
8. Physically Mount the material
9. Edit pattern placement on the PCB blank, Check cut width, Run Process
10. Check Isolation
11. Flip Material
12. Prepare the backing surface
13. Remove the board
14. Safely exit and shut down the machine

Housekeeping

1. Clean the PCB Surface.
2. Clean the PCB Tray and keep ready for next operation
3. Properly close the Machine Cover

Potential Hazards

***Impact, pinch and crush points
Entanglement and entrapment
Failure or malfunction***

***Dusts and fumes
Eye injury***

***Electrical components
Control errors Manual handling***

5. CNC Vertical Milling Machine (Tormach VMC Machine)

DO NOT use this machine unless someone instructed you in its safe use and operation and has given permission.

Safety Measures

1. Safety glasses must be worn at all times in the work area
2. A Mask must be worn every time you enter the Lab. Area.
3. Rings and jewellery must not be worn near moving machinery components.
4. Long and loose hair must be contained or restrained
5. Appropriate footwear with substantial uppers/Shoe must be worn.
6. Close fitting, protective clothing or a workshop apron is encouraged

Pre-operational Safety Check

1. Ensure you are familiar with CNC nesting and tool-pathing software functionality.
2. Locate & ensure you are familiar with the operation of the ON/OFF and emergency stop controls.
3. Ensure that the guard door and safety devices are in position and secured.
4. Only machine materials that are suitable for this machining process.
5. Ensure that the CNC machine cutting bit size conforms to specifications. The machine must be isolated while any adjustments are made to the cutter head of tool array.
6. Ensure all cutters are sharp and free of resin build-up or wear.
7. Adjust the waste collector shroud and coolant system correctly for maximum efficiency.
8. Be aware of any other personnel in the immediate vicinity and ensure the area is clear before using this equipment.
9. Familiarize yourself with all electrical and mechanical operations and controls, including any
10. Handheld keypad interface remote control.

Operational Safety Check

1. Never attempt to program this CNC machine without proper training.
2. Never pre-program any CNC Tormach VMC Machine to perform operations beyond the capacity of the machine.
3. Confirm all CNC programming instructions for the Tormach VMC Machine.
4. Ensure the work piece is securely held flat to the vacuum pads within the machine.
5. Ensure that the tool bit array tracking remains unobstructed during the CNC machining operation.
6. Never leave the CNC Machine in operational mode while unattended.

Housekeeping

On completion, isolate the switches. Leave the machine in a tidy, clean and safe manner.

Potential Hazards

Impact, pinch and crush points
Entanglement and entrapment
Failure or malfunction

Dusts and fumes
Eye injury

Electrical components
Control errors Manual handling

TRANSFORMING INNOVATIVE IDEAS INTO PROTOTYPES



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