

dFab MANUAL

WELCOME TO dFab!

The Digital Fabrication Studios at MICA (dFab) is a campus wide resource which offers access to computer aided design and manufacturing workflows. This is an experimental space that is a little tricky to define. It's a blend of fabrication, programming, engineering, ceramics, fibers, wood, steel, printmaking and whatever other skillsets you bring to the table. It's a place where failure leads to success through iterations and perseverance. We encourage you to defy traditional boundaries and think outside the box.

With this privilege comes the added complexity and responsibility of maintaining a safe and effective work environment. To do this we must be honest with ourselves by admitting our strengths and weaknesses, while communicating effectively.

WHAT TO EXPECT

As a participant in this environment, you are not expected to know how to do everything, but you are expected to know what a machine will do prior to pressing play. Follow good work habits by keeping your work area tidy, using the right tool for the job, documenting your work, and employing logical methods of deduction when troubleshooting problems on your own. Sometimes it takes repetition to attain a working knowledge, students should reach out for assistance in learning this equipment from dFab staff. **Don't "just wing it." You should be sure EXACTLY what will happen when you press "start."**

We are committed to offering a welcoming environment for beginners. This is complicated stuff and can be a bit overwhelming when you are new to digital fabrication. Seek out advice from our knowledgeable staff. Beginners are encouraged to start out with laser cutting. These hours are well staffed and offered regularly throughout the week and semester as reflected on our calendar.

Priority for equipment use is given to scheduled dFab courses. **Check the schedule and ask a technician for permission to work while a class is in session.**

We understand that mistakes sometimes do happen. **In the event that you damage equipment, do not attempt to recover on your own. Stop, make sure everyone is ok and that the threat has been removed, then contact the Digital Fabrications Studio Manager (rmckibbin@mica.edu).** You are not in trouble, but we want as much information as possible so as to avoid making the same mistakes in the future.

You should only use equipment which you have been trained on by an instructor or qualified shop technician. **All of this equipment is taught through coursework.** It is your instructors responsibility to discuss proper procedures with the class. Many times it is possible for you to learn from a student tech, however it is not their responsibility to teach you how to use this equipment for the first time. If you do not have notes from class and have no idea what you are doing, we may assume that you were not in class and may turn you away.

Information about equipment can be found on the dFab website <http://staff.mica.edu/rmckibbin/>. Students not currently enrolled in a dFab class may learn how to use this equipment independently provided there is qualified staff available to help out. We want you to learn this stuff, it's FUN!

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GENERAL POLICY

ACCESS

All currently enrolled MICA students in good standing with dFab have access to this space during shop hours. Anyone wishing to use this facility must read this entire document, print and sign the *dFab User Agreement* and turn it in to the Digital Fabrication Studios Manager.

Use of this facility is a privilege. Access to dFab can be revoked for the following reasons:

- Not cleaning up after yourself/putting tools away
- Repeated misuse of tools
- Repeated unsafe conduct
- Failure to immediately report a mistake leading to damage of our equipment
- Accessing dFab outside of posted hours without prior approval from the dFab Manager
- Repeated failure to comply with the guidelines outlined in this document
- Removing tools or equipment from dFab without permission from the dFab Manager

HOURS OF OPERATION

Current Hours of Operation are posted on our website (<http://staff.mica.edu/rmckibbin/>). **dFab is closed outside of our posted hours.** A qualified technician must be present for dFab to be open. Only dFab Technicians and advanced users may complete work outside of shop hours with pre-approval from the dFab Manager. The guards are instructed not to open dFab. **If you are found working in dFab outside of the shop hours without prior approval from Ryan McKibbin, dFab Studios Manager, you will lose access to this facility.**

dFab Manager office hours are held weekdays between 8:00am-8:45am, unless there is a workshop at that time. More complicated issues can be addressed with regard to procedures, processes and policy during office hours.

SOFTWARE

We use Rhino3d extensively in this shop. A basic understanding of this software is a prerequisite for using this space. While this is by no means the only CAD software out there, it is extremely capable, efficient, and relatively easy to learn. You are encouraged to spend time in our computer lab learning this software. Primary sources for learning are the Rhino Level 1 Training Manual, available for download at www.rhino3d.com/learn, pressing F1 to access help from within Rhino, and video tutorials like what is offered at www.Lynda.com. The lab is a great place to learn because you can shout out questions to one another which fosters a collaborative work environment. Be cool, help a friend!

MATERIALS

We do not provide any materials for student or faculty use.

If you order materials from a local vendor for delivery, you must be present at the time that the delivery arrives at MICA. We will not accept delivery on behalf of any student, faculty or staff and will turn the driver away. Most vendors will take a cellphone number and have the driver call you half an hour prior to delivery.

Certain processes should not be performed in dFab (for example: melting wax, plaster casting, mixing concrete, epoxy/heavy fumes). Please discuss options with the Digital Fabrication Studios Manager, Ryan McKibbin.

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ATTIRE

Proper shop attire is required at all times in the Main Shop (S125). This includes:

- Closed Toe Shoes, no flip flops, shoes must have a back
- No headphones, you are welcome to share your music on our radio
- No loose or baggy clothing
- Long hair must be tied back
- Use eye, ear, and respiratory protection when necessary

The above attire is expected only for the Main Shop (S125). The Computer Lab (S121), Classroom (S120), laser cutters and 3d printers (S124, S122) do not inherently necessitate this attire, however you are expected to have appropriate attire for the job you are performing. **Improper attire is cause to be cited for unsafe conduct.**

CONDUCT

1. Say hi to the tech on duty when you arrive. Check out with the tech on duty when you leave.
2. No food is allowed in dFab. At your instructors discretion, food may be allowed only in the classroom (S120) only. **No food should ever be in the computer lab.** Drinks in a non-glass sealed bottle are permitted anywhere in dFab. Be mindful of where you set your drink, cold drinks sweat and can cause damage.
3. If you have any questions or if something seems wrong, say something to the tech on duty
4. Only use tools which you are familiar and have had the proper training.
5. Wear proper clothing for the task you are performing
6. At the end of every shift, class and work session, you are responsible for cleaning up the shop, putting all tools away and putting tables back where they belong. If you need to store a project while in process, organize your project in such a way that it will be easy to move by someone else and make arrangements with the tech on duty.
7. **The tech on duty is in charge. What they say goes.** If you have been instructed differently, you are welcome to come back when your instructor is present to do it the way they instructed you. Please help us out by contacting the Digital Fabrication Labs Manager, Ryan McKibbin, if you happen upon any of these discrepancies. No one will get in trouble and its very helpful for me to know when a policy/workflow is not consistent.
8. Don't force anything, use the right tool for the job.
9. Work together, if you see someone who needs help, help them.
10. Put tools and equipment back where you got them.
11. We do not check out tools. All equipment from dFab should be used in dFab.

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LASER CUTTER POLICY

ACCESS

During Laser Hours, as shown on the dFab schedule (<http://staff.mica.edu/rmckibbin/Lasers.html>), we are staffed to help you learn the basics. This is the best time to come in looking for assistance with laser cutting for the first few times. Once you are able to use these machines safely and independently, please come in during regular shop hours.

SOFTWARE

While it is possible to cut from a variety of software, as a shop we only provide support using these machines with Rhino. This is an easy to learn and inexpensive software that is very capable, well rounded and very well suited for digital fabrication work.

STUDENT IN dFab CLASS

Your faculty will schedule time for the class to learn these machines and practice in class. Faculty should review student files and bring any questions to the dFab Manager.

STUDENT NOT IN dFab CLASS

The laser cutters are a great place to get started and are open to the entire MICA community during Laser Hours. We can generally accommodate independent projects from students across the campus, however priority is always given to students who are currently enrolled in a dFab course. Please check in with the tech on duty and make them aware that this is your first time. Start with vector cutting something small until you are familiar with the workflow and can work independently.

TESTING SETTINGS

Always start with a setting that is too low, and run a series of tests on your actual material increasing power or (decreasing speed to increase the effective power) until you reach a setting that cuts through but does not start a flame.

MATERIALS

Anything on the Paper, mat board, card stock, Cardboard, chipboard, Plexiglas, organic fabrics (spray lightly with water first), solid wood, plywood (fewer plies is better), cork.

If you would like to cut a material that is not on this list, please stop in during office hours, or contact the Digital Fabrication Studios Manager, Ryan McKibbin.

Banned materials include: Foam Core, Glass, Lexan, Metals, Polycarbonate, PVC, Styrene, Vinyl

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CNC ROUTER POLICY

ACCESS

Students wishing to use the CNC routers should take a class in dFab that covers the use of this equipment. If you have not taken a class which covers CNC machining as part of the curriculum and wish to use a CNC machine, hang around the lab and get down with the funky sweet culture. Ask to assist others who are already using this equipment and ask questions. Officially we do not train students on this equipment outside of coursework.

SOFTWARE

We use RhinoCAM to write the toolpaths for all of our CNC equipment. RhinoCAM is a plugin for Rhino which aids in the creation of gCode, a human readable text file which is actually sent to the machine. Essentially gCode is a list of x, y and z coordinates which tell the machine where to go. You must know how to draw and work in Rhino prior to attempting to use RhinoCAM.

STUDENT IN dFab CLASS

For the first few times you use our CNC machines, you will work closely with your faculty while using our equipment to ensure that the proper procedures and safety measures are followed. Once you have been fully trained on the use of this equipment you should review any files you would like to cut with your faculty bringing any questions to the dFab Manager. Once both of you are satisfied with the file, post the *.nc file to our server. At this time students can be added to the schedule and should purchase material. You (the person who programmed the toolpaths) must stay and watch over your file as it cuts, verifying that the machine is doing exactly what is expected.

STUDENT WHO HAS TAKEN A dFAB CLASS OR HAS USED OUR MACHINES

You must first prepare your file in Rhino and create toolpaths in RhinoCAM. Once you think your file is ready to go, contact the dFab Manager to review the operations, tooling and machining practices you have used. Once we have agreed on a finalized file we will add you to the calendar. You (the person who programmed the toolpaths) must stay and watch over your file as it cuts, verifying that the machine is doing exactly what is expected.

TOOLING/MATERIALS

Students will provide all materials, dFab provides a limited tool library. Students wishing to perform operations which necessitate tooling beyond our library should purchase their own tooling.

If you break a tool, you are responsible for replacing that tool. The cause must be known and properly addressed prior to running the file again. A discussion of the cause should involve the tech on duty and may involve the dFab Manager if both you and the tech are not 100% certain that the problem has been resolved. The tools we use range from \$25 to \$65 each.

Generally, all wood and wood products are acceptable to use on our CNC router, with the exception of woods and treatments which are toxic (such as pressure treating).

It is highly recommended that you start out with 2d cuts in MDF or plywood. If you are interested in 3d machining, you should first proof your file in foam, it is inexpensive and easily machined.

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3D PRINTER POLICY

ACCESS

Students currently enrolled in a dFab course are permitted to use these machines after class instruction. At this time there is no access to our 3d printers for students who are not enrolled in a dFab class.

We have 4 printers that are always set up for 1.75 mm PLA. These printers should always be in working order, if they do not work please alert a tech. Only qualified MICA technicians should work on these printers.

We have 4 rewrap Prusa i2 machines. These machines are free and offered to be checked out to students who want to modify them, print for free with mica plastic (pla/abs) or print with 3mm plastic. Contact Ryan McKibbin if you would like to check one out.

COMPUTER LAB POLICY

ACCESS

Please check with the tech on duty if you would like to use the lab while a class is in session. This lab is intended for students currently enrolled in a dFab class to work on dFab coursework. This is not a space for writing papers, checking email or Facebook. Students who are not enrolled in a dFab class may use our lab to prepare files for our equipment, provided students currently enrolled in a dFab course are not waiting for a computer.

CONDUCT

No Food and drink are allowed in the computer lab at any time, with the exception of a sealed non glass bottle. Do not unplug or touch the Ethernet jacks on the floor, for any reason! Please refrain from rolling around on the chairs, especially along the outer isles. This could destroy the thin ribbon cable which conveniently powers your workstation and delivers the world wide web.

MACHINE SHOP POLICY

Students must be trained on this equipment by Ryan McKibbin

ELECTRONICS POLICY

This space is provided for faculty to make kits that students will use in class. If you would like to work in this space, please ask the tech on duty.

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SPRAY BOOTH POLICY

The spray booth is available per appointment. We are required by law to keep a record of all chemicals used in the booth, inside the booth there is a binder where you must record your name, date, time student ID, material and amount used. Please contact Pete Karis or Ryan McKibbin to set up a time to use the spray booth.

1. No flames/smoking, No food, No drinks
2. You must clean before you use the space and after you use the spray booth
3. No personal materials are stored in the booth
4. This room is left empty at all times. Cleaning staff is instructed to dispose of anything in the booth daily.
5. One hour is permitted to allow your project to dry (longer with approval from Ryan McKibbin or Pete Karis). Permission must have a note with your name, contact info, start time and pick up time and Pete or Ryan's signature. Your project will be thrown away without proper documentation
6. Approved materials
 - a. Water based products
 - b. Certain oil based products (no VOC above 1000 grams/liter)
7. Safety
 - a. The fan must be running whenever anyone is spraying in this space.
 - b. "Volatile organic compounds (VOCs) are organic chemicals that have a high vapor pressure at ordinary room temperature. Their high vapor pressure results from a low boiling point, which causes large numbers of molecules to evaporate or sublime from the liquid or solid form of the compound and enter the surrounding air. For example, formaldehyde, which evaporates from paint, has a boiling point of only $-19\text{ }^{\circ}\text{C}$ ($-2\text{ }^{\circ}\text{F}$)." "Health effects include eye, nose, and throat irritation; headaches, loss of coordination, nausea; damage to liver, kidney, and central nervous system. Some organics can cause cancer in animals; some are suspected or known to cause cancer in humans. Key signs or symptoms associated with exposure to VOCs include conjunctival irritation, nose and throat discomfort, headache, allergic skin reaction, dyspnea, declines in serum cholinesterase levels, nausea, vomiting, nose bleeding, fatigue, dizziness"— Wikipedia

EMERGENCY PROCEDURES

1. Call 911 and give them the exact location of your emergency.
1400 Cathedral St. (Corner of Mt. Royal and Cathedral)
MICA Campus, Mt.Royal Station Building (stone building with clock tower)
dFab – First Floor
2. You are calling from 410 225 3245
3. Give your name
4. Describe the nature of the emergency (injury, fire, etc.)
5. Stay near the phone if possible to receive additional instructions
6. Call campus safety at 443 423 3333

Campus Safety should be notified of all injuries. They can provide assistance with First-Aid, injury assessment, and reporting.

Minor injuries not requiring attention from a medical professional can be treated using the First Aid kits mounted in S012.

Personal Protective Equipment Hazard Assessment Certification



Job Title: Students/Work Study/Technician

Department: Fabrication Studios

Location/Worksite: Digital Fabrication Studio
S120-132

Supervisor: Ryan McKibbin

Date: 1/13/16

Analysis: EHS Technician

Signature:

Tasks, Job Classification or Workstation	Potential Hazard	Type of PPE Required	PPE Recommended
Use of any hand held or stationary power tool	Airborne particles, Loud noises	Safety Glasses, Closed toe shoes	Hearing protection, dust mask
Material handling	Cuts/abrasions	Closed toe shoes	Gloves
Changing tooling	Cuts/abrasions	Ensure machine is unplugged or electronically disabled	Gloves
General cleaning	Airborne particles	Close toe shoes	Dust mask, safety glasses
Operating MultiCAM	Airborne particles Loud noises	Safety glasses for anyone in S101, Closed toe shoes	Hearing Protection
Operating all other CNC	Loud noises		Hearing Protection
ZCorp – Normal Operation	Airborne Dust when changing over material	Vacuum set up for particulate removal	Dust mask
zCorp – working with binder or waste bucket	Splash in eyes, ink on cloths	Goggles, Gloves	
zCorp – recycling powder	Airborne particles	Vacuum set up for particulate removal, dust mask	
Laser cutters - operation	Lasers	Ensure machine is closed. Never operate with top door open	
Laser cutters – cleaning	Airborne particles	Use Vacuum	Dust mask
Mixing sodium hydroxide solution	Corrosive chemical - chemical burn	Chemical gloves, goggles, face shield, chemical apron, closed toe shoes respirator	
Using sodium hydroxide solution	Corrosive chemical	Chemical gloves, eye protection	Respirator
Mixing lubricant for Haas	Splash in eyes	Goggles, gloves	
Using Soldering Station	Lead Fumes	Use provided ventilation system	Respirator

dFab USER AGREEMENT

After reviewing the dFab Manual (<http://staff.mica.edu/rmckibbin/Images/Manual.pdf>), **please print** all information and place your signature where required, authorizing your use of the Digital Fabrication Studios (dFab) at Maryland Institute College of Art

Student Information -- PLEASE **PRINT**

Last Name _____ First Name _____

Local Phone _____ MICA ID # _____

Emergency Contact Information -- PLEASE **PRINT**

Last Name _____ First Name _____

Phone _____

I, _____, have read, understood, and agree to abide by the policies outlined in the dFab Manual. I understand that the dFab Manual contains mandatory procedures that I shall observe at all times and that if I fail to abide by these rules I will lose access to this facility.

I understand that although I have been introduced to safety procedures dFab, there may be problems with equipment, materials, or the environment that could cause injury. I agree to ask for assistance from assigned dFab personnel whenever I am unsure or have any questions about fabrication related safety. I fully recognize and appreciate the dangers and hazards inherent in utilizing dFab. I assume all risks of personal injury, including death, while utilizing dFab resources. I understand that any violation of campus or dFab rules may result in termination of my privilege to use this resource.

To the best of my knowledge, there are no physical or other conditions that will interfere with my use of the Fabrication Labs. I am at least 18 years of age and I enter this agreement knowingly and voluntarily.

Guardian Signature _____ Date _____

(If student is not at least 18 years of age)

Student Signature _____ Date _____