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I. SCHEDULE OF OPERATIONS

DAILY SCHEDULE - LOS ANGELES

The Digital Fabrication Laboratory (DFL) on the Los Angeles campus is open for fifty-five (55) hours per week during the fall and spring semesters. It is open for twenty-five (25) hours per week during the summer semester.

The regular full semester hours of operation of the Los Angeles DFL are as follows:

Monday: 11-8
Tuesday: 11-7
Wednesday: 11-8
Thursday: 11-8
Friday: 11-7
Sat & Sun: 12-6

The summer semester hours on the Los Angeles campus are as follows:

Monday-Friday: 12-5
Closed on the weekends.

DAILY SCHEDULE - SAN DIEGO

The Digital Fabrication Laboratory (DFL) on the San Diego campus is open for twenty (20) hours per week during the fall and spring semesters. It is open on an as needed basis (but not to exceed 20 hours per week) during the summer semester.

The regular full semester hours of operation of the San Diego DFL are as follows:

Monday: 12-4
Tuesday: Closed
Wednesday: 12-4
Thursday: 12-4
Friday: Closed
Sat & Sun: 12-4

ANNUAL SCHEDULE - BOTH CAMPUSES

The Digital Fabrication Laboratory on both the Los Angeles and the San Diego campuses are open throughout the year. However, they close for the following:

• the first two weeks of summer for cleaning and maintenance
• the first week of school for new employee training
• all university holidays and some events (including school lectures)

THERE IS NO AFTER-HOURS ACCESS TO THE DFL.
II. ORGANIZATION

LOS ANGELES

Digital Fabrication Laboratory Site Supervisor
Associate Dean of the School of Architecture
Randy Stauffer

Digital Fabrication Laboratory Manager
Jason King

Digital Fabrication Laboratory Assistant Managers
Karni Hadidian
Ahdom Sayre

Digital Fabrication Laboratory Student Technicians
List on file in the Digital Fabrication Laboratory

SAN DIEGO

Digital Fabrication Laboratory Site Supervisor
San Diego Campus Administrative Director
Debra Abel

Digital Fabrication Laboratory Manager
Shawn Benson

Digital Fabrication Laboratory Student Technicians
List on file in the Digital Fabrication Laboratory
DIGITAL FABRICATION LABORATORY
GENERAL REPORTING CHAIN (SAN DIEGO)

DFL Student Technician
Student Interface

Level 1: Laser Cutter Certified
- Laser Cutter Assistance and
- Daily Facility Maintenance

Level 2: Laser Cutter and 3D Printer Certified
- Laser Cutter and 3D Printer Assistance and
- Daily Facility Maintenance

Level 3: Laser Cutter, 3D Print, and CNC Mill Certified
- Laser Cutter, 3D Printer, and CNC Mill Assistance and
- Daily Facility Maintenance

San Diego Administrative Director
San Diego Site Supervisor

DFL Manager
DFL Operations Oversight and Curricular Liaison

Associate Dean of the School of Architecture
Los Angeles Site Supervisor

Chairs of the School of Architecture
Curricular and Student Consult

Director of Human Resources
Contracts, Personnel, and Protocol Consult
III. ACCESS AND USE PROTOCOL

The DFL is accessible throughout the year to all Woodbury students who are enrolled in university coursework. All projects that are run in the DFL must be for expressly academic purposes - coursework or university-sponsored, student-run organization outcomes.

The DFL is accessible to all Woodbury faculty during the winter and summer breaks only. All faculty projects must be pre-approved by Digital Fabrication Manager and expressly for academic purposes - course development, projects sponsored by academic grants that will be presented to the faculty association, and faculty development opportunities (in the form of skill building workshops that are run by DFL personnel).

The DFL is accessible to all Woodbury staff during the winter and summer breaks only. All staff projects must be pre-approved by Digital Fabrication Manager and expressly for academic purposes - enhancement of technical skills that contribute to university job performance.

Absolutely no professional projects are permitted.

A. STUDENTS

ACCESS PROTOCOL FOR STUDENTS

In order to access the DFL, all students must have passed a gateway course (specified by their respective program) and a Digital Fabrication Laboratory Safety and Use Orientation. Enrollment in the Digital Fabrication Laboratory Safety and Use Orientation is dependent on passing the gateway course with a C+ or higher. Students must present an unofficial transcript verifying successful completion of the gateway course at the time of enrollment of the DFL Safety and Use Orientation.

The respective gateway courses are listed below:

- BFA Fashion Design: FDES 105 - Introduction to Digital Fashion Design
- BFA Graphic Design: GDES 107 - Digital Practice
- BFA Interior Architecture: ARIA 115 - Design Communication II
- B.ARCH: ARIA 115 - Design Communication II
- M.ARCH: ARCH 2742 - Digital Visualization or ARCH 6742 - Groundwork Visualization
- MS.ARCH: ARCH 2742 - Digital Visualization or ARCH 6742 - Groundwork Visualization

DFL Orientations will be offered during the first month of each semester only. If a student fails to enroll and complete the orientation during the scheduled period of offering, the student will not be allowed access to the DFL during that semester and must wait to enroll in the next semester's orientation offerings.

Students must enroll in an orientation by signing up with DFL management; DFL management will issue an orientation invitation at the conclusion of the preceding semester. Students should anticipate their need to use the Digital Fabrication Laboratory and make arrangements for that use as far in advance as possible. In order to participate in an orientation, students must respond with their intent to enroll by the deadline specified within the DFL management announcement.

At the conclusion of the DFL Orientation, students must demonstrate understanding of the safety
and use procedures and protocol by passing an exam. Once students have passed the exam, the DFL Manager will provide the students with an electronic username and password allowing them to reserve time on the machines and with an identification card sticker granting them physical access to the laboratory.

The DFL Safety and Use Orientation will consist of one week of training and will cover the following:

- safety (general and per machine)
- material guides (per machine)
- file set-up (per machine)
- access and reservation allowances
- costs and resources

Undergraduate students must maintain a GPA of 2.0 or better and graduate students must be in good academic standing in order to use the DFL. Chairs will provide the DFL Manager with a list of low-performing students at the conclusion of every semester. Students on the list will be blocked from use. (If a Chair determines that suspension from the DFL will further negatively impact a student’s academic performance, the Chair may grant permission for an exception for the student - on a case-by-case basis.)

Any student who, at any point, displays a flagrant inability to use the DFL appropriately will be suspended from access and required to retake the DFL orientation. Simply asking questions or requesting clarification does not constitute inability; students are encouraged to confirm understanding and display curiosity. Inability may be described as wrecklessly proceeding without caring or knowing.

Any student who willfully breaks DFL policy will be expelled indefinitely from DFL access; the duration of expulsion will be determined by the DFL manager and the Site Supervisor and will be appropriate to the severity of the infraction. All infractions will be reported to and any questions will be deferred to the Site Supervisor.

Depending on the severity of the infraction, the incident will be reported to the Judicial Review Board overseen by the Dean of Students in OSD; students, in these circumstances, will be expelled from DFL access until an official hearing is held and a decision determining next actions is made.

USE PROTOCOL FOR STUDENTS

General

Students reserve time on the DFL machines via the online appointment software: https://www.appointment-plus.com/login.php.

Students who exceed the allowable block of time will not be permitted to finish their job(s). DFL management and lab technicians will monitor and enforce this policy.

Machine logs must be maintained for all machines. All questions and incidents must be noted in the machine log and tied to a specific moment of use and user.

When using a machine, students must sign in and out of the machine log.
Laser Cutter

Students must provide their own materials for use in the laser cutters. (For allowable materials, see below.)

Students may reserve up to 1 hour per day, but not to exceed 3 hours per week, on the laser cutters.

Students are responsible for proper file set-up and overall operation of the laser cutters.

Students are required to be present and attentive to the laser cutter throughout the execution of a job. A laser cutting job is never to be left unattended.

Lab technicians are available to assist. Students with questions regarding laser cutting should direct them to the on-duty lab technician.

Students displaying an inability to operate the machines will be treated according to the Access Protocol.

3D Printer (ZCorp)

All materials for the ZCorp 3D Printer are provided by the DFL. (For costs, see below.)

Prior to making a reservation, students must first insure that the base .stl file is printable (has proper thickness and units, no naked edges, unified mesh normals and water-tight mesh, etc - per orientation specifications). Students must next use the time-estimation tool in the Z-Print (located in the DFL and the architecture complex computer laboratories) and know the project print time. Students may then reserve the appropriate amount of time on the machine.

Students must excavate their own model(s) upon completion of the 3d printing. Excavation time generally takes between 45-60 minutes. This time must be included in the reservation duration.

Lab technicians are available to assist. Students with questions regarding their 3D print model, should make an appointment with the 3D print consultant.

Students displaying an inability to operate the machines will be treated according to the Access Protocol.

3D Printer (uPrint+)

All materials for the uPrint+ 3D Printer are provided by the DFL. (For costs, see below.)

Prior to making a reservation, students must first insure that the base .stl file is printable (is big enough, has proper thickness and units, no naked edges, unified mesh normals and water-tight mesh, etc - per orientation specifications). Students must next use the time-estimation tool in the Dimension CatalystEX (located in the DFL) and know the project print time. Students may then reserve the appropriate amount of time on the machine via an on duty lab technician on Appointment-Plus.
Students must account for model bathing time. Bathing time typically takes between 8-24 hours. Students may not bathe their own objects. Students must schedule a time online between, 9am - 1pm M-F, with a laboratory technician in order to bathe their object(s). The on-duty laboratory technician will accompany the student to the bath. The student will monitor the entire bathing process and will be responsible for the exceptional and safe cleanup of the station and tray. Laboratory technicians will not bathe objects on command. If a project requires substantial effort and monitoring additional to the original appointment, then student(s) will need to schedule a later time for object bathing and retrieval. Gloves and goggles must be worn within 5 feet of bathing station.

If small or fragile pieces are lost in the bathing process, a laboratory technician will drain and look for lost items. DFL technicians are not responsible for the pieces lost in the bathing process. Students will be warned about small pieces and the complications that may arise when models are reviewed prior to printing.

Lab technicians are available to assist. Students with questions regarding their 3D print model, should make an appointment with the 3D print consultant.

Students displaying an inability to operate the machines will be treated according to the Access Protocol.

Students who abuse the care and clean-up protocols are subject to DFL limitations or expulsion.

3D Printer (MakerBot)

In order to print using the MakerBot, students must supply their own spool of plastic filament (available in the Los Angeles student bookstore or online at http://store.makerbot.com).

Prior to making a reservation, students must first insure that the .stl file is printable (has proper thickness and units, no naked edges, unified mesh normals, water-tight mesh, etc - per orientation). Students then must use the time-estimation tool in ReplicatorG (available as a free download from https://github.com/makerbot/ReplicatorG/downloads) and know the project print time. Students may then reserve the appropriate amount of time on the machine.

Students should be sure to account for 3D printing mishaps and errors when calculating reservation time. The software only gives an estimate for a perfect run; the DFL recommends an additional 30%. MakerBots must be attended at all times when running due to hazards of failures.

In San Diego, MakerBots are available for checkout by specific studio classes for the duration of said class. (See form #MakerBot Check-Out). Any damage incurred by said class will remain the responsibility of the individual who damaged the machine. The Lab Manager will assist the responsible individual in acquiring parts to fix the machine via Makerbot website. MakerBots will be turned back in nightly.

Any washing associated with the MakerBot water soluble support will follow protocol equal to that of the UPrint+.
Lab technicians are available to assist. Students with questions regarding their 3D print model, should make an appointment with the 3D print consultant.

Students displaying an inability to operate the machines will be treated according to the Access Protocol.

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**CNC Mill**

Students must provide their own materials for use on the milling table. (For allowable materials, see below.)

All students wishing to use the CNC mill must schedule a consultation before purchasing or preparing stock. Students must come to the consultation prepared with a Rhino model file with toolpaths already generated. The CNC mill consultant will review the file and give advise on material selection and preparation. The CNC mill consultant will recommend the type and quantity of bits necessary to complete the job. All bits used in the mill must be pre-approved by the laboratory technician on-duty.

At the consultation, the CNC mill consultant will determine whether or not the project is ready to proceed to milling. If not, the student must schedule a review consultation. If so, the CNC mill consultant will work with the student to determine a mill time.

Milling projects are time intensive. (Students should expect a minimum duration of at least two weeks between the first consultation and the job completion for a simple project).

Only certified lab technicians will operate the CNC milling machine. (Lab technicians will sign projects in and out of the machine log.)

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**FOR ALL MACHINES - WHEN IN DOUBT, ASK QUESTIONS.**

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**B. FACULTY / STAFF**

**ACCESS PROTOCOL FOR FACULTY / STAFF**

Faculty and staff who are interested in using the DFL should contact DFL management for project-specific scheduling, training, and evaluation. The DFL Management will confirm access permission with the Site Supervisor.

The order of DFL access and project-run priorities for faculty / staff is as follows:

1. Contact the DFL Manager or Chair and fill out a form application for the proposed use a minimum of 2 weeks in advance.

2. The Digital Fabrication Lab Manager, in coordination with the Site Supervisor and the respective Chair, will determine the academic validity of the project and confirm authorization with notes and a signature.
USE PROTOCOL FOR FACULTY / STAFF

Faculty may run academically affiliated independent projects during the winter and summer breaks only. All faculty projects must be approved by the DFL Manager and the Site Supervisor. Management will review the project to insure DFL laboratory appropriateness and to assess and provide appropriate training and resources. Any questions will be deferred to the Site Supervisor.

The DFL is an academic research laboratory. Absolutely no professional work is allowed.

Faculty members are expected to be in the lab actively developing each project. There are no drop-offs.

C. COURSES

USE PROTOCOL FOR COURSES

Faculty who make DFL requisite assignments in their courses must provide the DFL Manager assignment handouts one week prior to the start of classes so that the DFL Manager can adequately prepare for the semester. All assignment handouts using DFL resources will be kept on record by the DFL Manager.

The DFL Manager will send out a call for projects one month before the beginning of each semester. Faculty, at that time, should communicate the DFL dependent specifics of their course requirements to the DFL Manager through the written assignment handouts and via scheduled meetings. The DFL Manager then will work with faculty to block out dedicated time during the semester for completion of the respective assignments. All semester projects will be accommodated on a first-come, first-serve basis.

Any assignments that develop over the course of the semester must be vetted with the DFL Manager - no less than three weeks in advance. There is no guarantee that the DFL can accommodate course assignments initiated after the start of the semester and that do not comply with DFL expectations.

COURSE ASSIGNMENT RESERVATION EXPECTATIONS

Faculty must submit the following to the Digital Fabrication Laboratory Manager in order to reserve the Digital Fabrication Laboratory for specific assignments:

- Contact Information: Faculty Name, Phone Number, Email Address
- Course Information: Course Name, Meeting Days and Times, Number of Students
- Course Syllabus
- Assignment / Project Description and Information, including:
  - Machine(s) and Materials to be Used
  - Number and Scale of Student Projects
  - Dates and Duration of Request
  - Staffing and Training Needs
  - Special Requests
D. DFL PROJECT-RUN PRIORITIES

The order of DFL access and project-run priorities is as follows:

1. DFL Manager approved course assignments. (Faculty must schedule DFL dependent assignments at the start of the semester.)

2. Student appointments. (Students may only make appointments 1 week in advance.)

3. Late course requests. (This includes any projects not approved by the DFL Manager within the first two weeks of the semester.)

E. OPERATIONAL PROTOCOL

The Digital Fabrication Laboratory strives to observe and uphold all scheduled activities and appointments.

DFL personnel will enforce the start and finish times of activities and appointments. All users must, in turn, respect both individual and facility time allocations. Users will be asked to reschedule if they are more than fifteen minutes late to an appointment. Users will be kicked-off of machines if they exceed their scheduled times.

The DFL cannot, however, guarantee scheduled activities and appointments. Machines requiring maintenance take precedence over the running of jobs. If a job must be preempted by maintenance, the user will be placed on a waiting list and notified of the first available appointment.

The DFL apologizes in advance for any inconveniences.
IV. DIGITAL FABRICATION LABORATORY SAFETY AND USE ORIENTATION

A. ORIENTATION LOGISTICS

The prerequisite to access and use of the Digital Fabrication Laboratory is the Digital Fabrication Laboratory Safety and Use Orientation. Students must pass a gateway course (on page 8) in order to enroll in the orientation. Faculty and staff must request and acquire permission to access and use the Digital Fabrication Laboratory; upon receipt of permission to access the DFL, the faculty or staff member must make arrangements to pass a software exam and complete the orientation.

The Digital Fabrication Laboratory Safety and Use Orientation will be developed by the Digital Fabrication Laboratory Manager and overseen by an Assistant Manager.

The orientation will consist of two parts - one for 3d printing and laser cutting and one for CNC milling.

Each machine requires the following basic software knowledge:
• Laser Cutters: Adobe Illustrator
• 3D Printers: Rhino
• CNC Mill: Rhino

If the gateway course required for the student’s major does not cover the appropriate software, students can enroll in a seven-week workshop offered through the School of Architecture. The recommended course is ARCH 2742: Digital Visualization.

Students who pass the first orientation only will be permitted to access the 3d printers and laser cutters. Students must pass the first orientation in order to participate in the second orientation. Students who pass the second orientation will have access to all of the Digital Fabrication Laboratory machines. The stickers that students receive on their ID’s will make this distinction.

Part 1 of the orientation, for 3d printing and laser cutting, will last for one day. Part 2 of the orientation, for CNC milling, will last for four days.

Each orientation will accommodate twenty students. In turn, in Los Angeles, four orientation sessions will be run at the beginning of each full semester; as many overload orientations as are needed will be run during the summer. In San Diego, two orientation sessions will be run at the beginning of each semester.

B. ORIENTATION CONTENT

PART 1: LASER CUTTING

General
• How to make an appointment and daily / weekly maximums
• File Preparation
• Deleting duplicate curves
• Simplifying curves
• Exporting from Rhino to Illustrator
• Stroke weights in Illustrator
• Standard RGB colors for cutting, scoring, etching
• Power, speed and frequency settings for both the Universal and Epilog machines

Materials
• Size limitations (24"x36" on all machines)
• Thickness limitations (varies by material & machine)
• Acceptable Materials
  • Acrylic (verify laser safe)
  • Anodized Aluminum
  • Brick
  • Cardboard (1-ply only)
  • Chipboard
  • Corian
  • Cork
  • Ceramic
  • Cloth/Felt/Hemp/Cotton
  • Glass
  • Leather/Suede
  • Lucite
  • Magnetic Sheet
  • Marble/Granite
  • Mat Board
  • Museum Board
  • MDF
  • Mylar
  • Paper/Card Stock
  • PETG
  • Plexiglass
  • Plywood/Composites
  • Rubber (non-chlorine)
  • Sign Foam
  • Solid Styrene
  • Wood

Unacceptable Materials
• Foamcore
• PVC (or anything containing chloride)
• 2-Ply Cardboard
• Polycarbonate/Lexan
• ABS
• HDPE
• Polystyrene Foam
• Polypropylene Foam
• Fiberglass
• Coated Carbon Fiber
• Casting Resins

Machine Operations
• Turn Exhaust on (multiple components)
• Turn Air Assist on (Epilog only)
• Set Focus Height (manually)
• Run job
• Recycle or throw away all scrap material
• Clean all surfaces after use

Safety & Potential Hazards
• Fire: Cutting materials with a laser frequently causes flaming and/or sparking. Some materials are more prone to causing flaming or sparking than others. Adjust power, speed and frequency/ppi settings to reduce the flame. Never leave the laser unattended, even if for a very short time, and be attentive while operating the machine. Make sure any flame present does not come into contact with any part of the laser system as flame will damage the machine. Small flames can easily lead to larger fires and risk the health, safety and lives of others. Pay attention to any smoke or smouldering present after cutting as off-cut material may be on fire within the down-draft table. Should a fire ignite, if small enough, extinguish the fire with an extinguisher present at each machine or mounted to a near-by wall. However, keep in mind that when the top door to the machine is opened, additional oxygen may be supplied to the fire, causing the fire to grow. If the fire is too large, exit the room, making sure all doors close behind you, and alert others by activating an alarm or calling emergency response. An Incident Report must be completed by both the user and Lab Staff.
• Particulate: All airborne particulate presents a potential health concern regardless of the nature of the material being cut. The method of cutting materials with heat as employed in laser cutters generates smoke and causes particulate to be dispersed into the air. Ventilation systems meeting equipment manufacturers’ recommendations are connected to each laser cutting machine to remove air, vapor, and particulate from the unit while cutting. Opening the door to the laser cutter to remove material after it has been cut releases some airborne particulate that has not yet been evacuated; a delay in opening the unit may decrease the amount of particulate dispersed. Disposable dust masks are available to users to reduce respiratory exposure to this particulate.
• Radiation: Exposure to the laser beam may cause physical burns and can cause severe eye damage. Do not stare at the bright light emitted by the laser or at the red dot pointer. Safety mechanisms are installed on the two doors on each machine to immediately disable the CO2 laser beam when open, however, the red dot pointer is not deactivated by the opening of either door.
• Fumes: Fumes can be released when materials are heated, melted and burned. Cutting certain types of materials with a laser will release toxic fumes. For this reason, a number of materials are not permissible for cutting with a laser. Cut only those materials listed above as appropriate and do not attempt to cut those which are not on the list without first consulting with Fabrication Lab staff. Fumes released that are not necessarily toxic can still be a nuisance and offensive.

PART 1: 3D PRINTING

File Submittal Protocol

File Preparation
• Machine wall thickness limitations
• Build bed size
• Checking for closure
• Unifying normals
• Techniques for efficient modeling
• Exporting and mesh verifying

Cost

Model Excavation & Safety (wear gloves and a dust mask)

Post-Printing Finishing Processes

PART 2: CNC MILLING

Part 2 of the orientation will cover the following material:

Part 2 of the DFL orientation will be a 4-day intensive workshop in which students will learn the specifics of setting up a file in RhinoCAM. Additionally, students will be informed about what materials are allowed on the CNC Mill and basic mill safety.

STUDENTS DO NOT OPERATE THE CNC MILL AND ARE NOT ALLOWED TO ENTER THE MILL ROOM WHILE A JOB IS RUNNING.
C. ORIENTATION EVALUATION

SOFTWARE PREREQUISITE EXAM

Laser Cutting

To prove ability to access the laser cutters, email a cut-ready Illustrator file to jason.king@woodbury.edu for review.

- All bed sizes are 24x36.
- Files must be RGB.
- Color Standards
  - Red : Cut
  - Blue : Score
  - Black : Etch
- Lineweights must be set to .001

3D Printing

To prove ability to access the laser cutters, email a print-ready STL file to jason.king@woodbury.edu for review.

- Maximum build area is 8x10x8
- Minimum wall thickness is .0125”
- All normals must be unified
- Model must be watertight (no naked edges)
- All meshes must have thickness
- No self-intersecting surfaces
- No “bad” geometry
- No open geometry
Name: _________________________________________

email: _________________________________________

**Laser Cutter Exam Content**

1. What are the RGB values for the following colors:

   |   |   |   |
---|---|---|---|
**RED** | R | G | B |
---|---|---|---|
**GREEN** | R | G | B |
---|---|---|---|
**BLUE** | R | G | B |

2. By default, Red is ______________________, and Blue is _______________________.

3. I am allowed to sign up for _____ hours per day, and _____ hours per week, maximum.

4. List two materials NOT allowed on the laser cutters:
   a) __________________________________
   b) __________________________________

5. For the Universal, I must make sure that the air-assist is set to _____% for every job.

6. Three commands in Rhino will make for a better Illustrator file and a higher quality and more timely cut. They are:
   a) __________________________________
   b) __________________________________
   c) __________________________________

1. In Illustrator the stroke width must be ________________.

8. The bed size for the Universal is _______ x ________. The Epilog is ____________ x ______________.

9. The DFL will supply masking tape for me.
   True______  False______

10. My file is in CMYK, but the red looks exactly the same on the screen so it will cut.
    True______  False______

11. My review is tomorrow and I have to cut out all these rectangles. May I?
    Yes______  No______
Name:_______________________________________

email:_______________________________________

3D Zcorp Printing Exam Content

1. The cost of printing on the ZCorp printer is $________ per__________.

2. The minimum wall thickness for a model printed by the Zcorp printer is ________ inches.

3. My print had walls too thin and broke. My normals weren’t unified and my print came out strange. My model was sloppy and my print is very bad. In all of these cases, you will be charged full cost for your model.

   True______     False_____

4. List two Rhino commands you can use to check your models:

   a)________________________________

   b)________________________________

5. It is the job of the DFL techs to fix my model for me.

   True______     False_____

6. Models should be exported as what filetype for 3D Printing?

   _______________________________

7. I was unable to make it to the Fab Lab when my model was completed. When the DFL tech excavated it, he/she broke it. Who is responsible?

   ______________

8. I need this printed for tomorrow. Is this possible?

   Probably______     Probably not_______

9. The build volume of the ZCorp printer is ________ x _________ x _________.

10. I modeled my building and scaled it down to fit in the build bed envelope. It should come out fine, especially the details.

    True______     False_____
CNC MILL EXAM

Name:_______________________________________

email:_______________________________________

CNC Milling Exam

1. The software used to create toolpaths is called ____________________________.

2. CAM stands for ________________  ________________  ___________________.

3. The maximum Z depth of the CNC Mill is ______________________.

4. The mill can cut a 10” straight vertical wall.
   True______     False_____

5. While my job is running, I should be in the ______________________________.

6. For most jobs the spindle RPM should be ____________ RPM.

7. For parallel finishing (or any operation with constant Z movement) the maximum feedrate is _________ipm.

8. The two most common toolpaths operations to use in one job are __________________ & __________________________.

9. It is the job of the DFL techs to make my toolpaths for me.
   True_____     False____

10. When my job is complete the DFL techs will clean up.
    True_____     False_____
V. BEHAVIOR, SAFETY, AND EMERGENCY STATEMENTS AND PROCEDURES

A. GENERAL BEHAVIOR AND ETHICS

Digital fabrication projects are highly detailed, technically specific endeavors. Even though digital fabrication is an efficient way of making, a lot of time needs to be devoted to project preparation and set-up. DFL users must be aware of and willing to put in the effort to understand and learn digital fabrication technology; the DFL is, in turn, a space of learning, not a drive-through.

The DFL has limited resources for a substantial population. Please be considerate of the demands on the facility and the staff and your fellow DFL users. In particular, DFL personnel are highly trained specialists and devoted educators dedicated to the advancement of digital technology and making. Above all, respect their advice and instructions.

DFL personnel will intervene whenever they observe an opportunity to convey best practices or to avert a problem. These interventions will take place in response to any of the following circumstances and beyond:

- If you are using DFL machines simply to get something done easier or faster, you do not understand the technology; you will be directed to re-think the execution of your project, if it is deemed to be an ill-considered short-cut.
- All projects are not suited for all machines; you will be directed to re-think the execution of your project, if it is not appropriately engaging the equipment, a process, or a technique.
- Space and time are limited; you will be redirected, if you are taking more than your fair share.
- The machines are complicated and expensive; you will be corrected, if you are misusing the resources.
- Each individual’s project is the most important and everyone in the DFL is operating under case-specific pressures; you will be encouraged to think communally, if you are behaving selfishly.
- A clean, safe environment is everyone’s responsibility; you will be reprimanded, if you are leaving messes and littering.

Bottom line, be courteous, diligent, and professional. And, always discuss issues and questions with the DFL personnel.

The DFL is a learning space and all students must follow the Code of Conduct set forth in the Student Handbook. All rules and regulations in Article II of the handbook are applicable and will be enforced. DFL personnel may revoke privileges to the space if they feel a student does not comply with these rules and regulations. See pages 154 through 161 of provided link for complete copy of Code of Student Conduct:

http://www.thezonelive.com/SchoolStructure/CA_WoodburyUniversityOfcofStudentDevelopm/handbook.pdf

If a student is found breaking the rules and regulations set forth in the Student Handbook, DFL personnel will submit an incident report to the Office of Student Development. All infractions will be reported to the Dean of Students and/or Security depending on the severity of the infraction. The DFL personnel reserve the right to refuse service to anyone in violation of these expectations. DFL privileges will be revoked for egregious or repeat non-compliance and misuse. All actions leading to revocation of privileges will be submitted to OSD for review by a judicial review board hearing and sanctions beyond revocation of privileges applied.
B. MACHINE SAFETY STANDARDS

Machine Safety Standards are detailed in the Equipment and Operation Protocol.

C. MINOR INCIDENTS

The DFL defines minor incidents as any abnormality in operations that results neither in bodily injury nor in property damage that exceeds $250 in value. Minor incidents include, but are not limited to, job errors, losses of materials, and easily reparable machine malfunctions. In addition these incidents include, but are not limited to, items 6, 7, 12, 13, 14, 15, 16, 17 in Article II of the Code of Conduct.

If a minor incident affects University property and is determined by Digital Fabrication Laboratory management to be of no user fault, the Digital Fabrication Laboratory will absorb any cost of reparations into its operating budget.

If a minor incident affects University property and the user is suspected of fault (through wanton abuse or disregard), the Digital Fabrication Laboratory management will report the incident based on reporting protocol listed below. If it is determined by Digital Fabrication Laboratory management and the Site Supervisor that the property damage is the fault of the user, the Associate Dean will report the incident to Human Resources and to the Dean of Students in the office of Student Development for appropriate university investigations, review, and disciplinary actions as appropriate.

If a minor incident affects user property, period, the user will absorb any cost of reparations. The Digital Fabrication Laboratory does not guarantee the quality of any of its productions; users assume all risk for the property that they bring into the Digital Fabrication Laboratory.

All minor incidents must be recorded in the respective facility or machine log and be reported to the appropriate authorities.

D. MAJOR INCIDENTS

In case of all life threatening emergencies call 911.

DFL Personnel will assist all occupants in the DFL to follow the standards of the Woodbury University Injury and Illness Prevention Program on file in Human Resources Department in the event of a major incident.

The DFL defines major incidents as any abnormality in operations that results in bodily injury (however minor), in property damage that exceeds $250 in value, and in human and natural calamity. Major incidents can be classified into two categories, those that are contained and singular and those that are extended and compounding.

If a major incident is evidently contained and singular (affecting only one person and / or one machine), all activity in the Digital Fabrication Laboratory must shut-down and stop. All non-essential personnel must exit the premises. The Digital Fabrication Laboratory management will seek the appropriate assistance (including emergency services and University authorities, as needed) to assess the damages. The Digital Fabrication Laboratory will not reopen until management has determined that it is acceptable to do so.
If a major incident is potentially or evidently extended and compounding (affecting multiple people and/or the larger facilities), all activity in the Digital Fabrication Laboratory must shut-down and stop and everyone must follow evacuation procedures as outlined in the University Injury and Illness Prevention Program. Digital Fabrication Laboratory management should seek the appropriate assistance (including emergency services and University authorities). The Digital Fabrication Laboratory will not reopen until management has determined that it is acceptable to do so.

If it is suspected that a user is at fault for a major incident, the user will be suspended, until otherwise ruled, from Digital Fabrication Laboratory access and use and subject both to University judicial review and external criminal and legal investigation.

All major incidents must be recorded in the respective facility or machine log and reported to the appropriate authorities as per the reporting protocol outlined immediately following.

E. EVACUATION PLAN

Refer to the University Injury and Illness Prevention Program for an Evacuation Plan, including means and routes of egress and designated assembly areas.
F. REPORTING PROTOCOL

DIGITAL FABRICATION LABORATORY EMERGENCY AND SECURITY REPORTING STRUCTURE (LOS ANGELES)

DFL Student Technician
Student Interface
Level 1: Laser Cutter Certified
Laser Cutter Assistance and Daily Facility Maintenance
Level 2: Laser Cutter and 3D Printer Certified
Laser Cutter and 3D Printer Assistance and Daily Facility Maintenance
Level 3: Laser Cutter, 3D Print, and CNC Mill Certified
Laser Cutter, 3D Printer, and CNC Mill Assistance and Daily Facility Maintenance

Associate Dean of the School of Architecture
Los Angeles Site Supervisor

DFL Manager
DFL Operations Oversight and Curricular Liaison

DFL Assistant Manager 1
DFL Operations and Floor Manager

DFL Assistant Manager 2
DFL Operations and Floor Manager

Executive Vice President and Provost

Director of Community Services
Safety and Security Consult

Dean of the School of Architecture

Dean of Students
Student Judicial Consult

Director of Human Resources
Contracts, Personnel, and Protocol Consult

Associate Dean of the School of Architecture

Dean of Students

Director of Human Resources

Director of Community Services

Executive Vice President and Provost

Director of Community Services
Safety and Security Consult
G. CONTACTS

EMERGENCY - WOODBURY LOS ANGELES

Woodbury Security Cell 1: 818.355.8026
Woodbury Security Cell 2: 818.355.8026

EMERGENCY - EXTERNAL LOS ANGELES

Police, Fire, Ambulance: 911
Non-Emergency Police Assistance: 818.238.3333

EMERGENCY - WOODBURY SAN DIEGO

Woodbury Security Desk: 619.235.2900 x 25

EMERGENCY - EXTERNAL SAN DIEGO

Police, Fire, Ambulance: 911
Non-Emergency Police Assistance: 619.531.2000

EQUIPMENT AND MACHINE AGENTS

Universal Laser Tech: 714.916.3363 (Greg Islas, Kluz International)
Universal Laser Tech (auxiliary): 310.429.7095 (Rick Damiani, The Paton Group)
Epilog Laser Tech: 714.540.2233 (Cutting Edge Systems)
Epilog Laser: 303.215.9171
CNC Tech: 310.429.7095 (Rick Damiani, The Paton Group)
3D Print Tech: 714.625.7727 (Paul Craig, 3DRP)
3D Print Tech SD: 310.429.7095 (Rick Damiani, The Paton Group)
VI. EMPLOYEE PROTOCOL

A. OPENING AND CLOSING THE DIGITAL FABRICATION LABORATORY

The only individuals authorized to open the Fabrication Lab are:

- Keyed Managers
  For their scheduled hours of work only
- Woodbury Security
  Emergency situations only
- Woodbury Maintenance
  With explicit permission from DFL Manager only
- Woodbury Facilities Manager
  With explicit permission from DFL Manager only
- Woodbury Specified Staff
  With explicit permission from DFL Manager only

B. POSITION RESPONSIBILITIES

DIGITAL FABRICATION LABORATORY MANAGER
(Key holding or keycard authorized.)

- manage DFL operations, staffing, and usage by students and faculty (and alumni and outsiders)
- establish and uphold best-practice, schedule, and use protocol for student and faculty (and alumni and outsider) access
- organize and publish laboratory open hours
- monitor the income and outcome of the DFL and assist in the accounting and tracking
- assist with the management of the lab budget, payment policies, service contracts, and consumables purchases
- establish and uphold a consumables payment monitoring system
- assist with the development of DFL safety and use protocol and maintain a DFL policy manual and website
- enforce the safe usage of the machinery towards the prevention of equipment damage and/or human injury
- perform daily machine maintenance to assure continued effective operation
- advise and assist in the continued outfitting of the DFL
- coordinate equipment installations and facilities cleaning and maintenance
- oversee inventory and supplying
- operate as the primary point person for all student contact with the DFL equipment
- perform digital model checks and assist in the translation of computer models to productive files
- conceptualize and manage (with faculty) the integration of the DFL into the design curriculum
- conceptualize and organize faculty and student equipment training sessions
- work with faculty to coordinate assignments and to develop DFL workshops
- develop opportunities to educate students, faculty, and staff in the effective use of DFL technology
- establish and coordinate the DFL staffing needs
- identify, process, and train assistant managers and student technicians
- research, test, recommend, and pursue DFL expansions, trends, and upgrades
- seek opportunities for external partnerships and for material donations
- (long-term) establish public programs for the lab, bringing professional practitioners and academic
researchers to the university to work with students and faculty for workshops (potentially in conjunction with the school lecture series)

DIGITAL FABRICATION LABORATORY ASSISTANT MANAGER
(Key holding or keycard authorized.)

- assist with the management of the DFL, including the training and supervision of the student technicians
- uphold and enforce DFL safety and usage protocol and policy
- maintain DFL equipment and facilities and supervise the student technicians in the performance of their duties
- deliver DFL orientations and training to students, faculty, and staff and, when the DFL Manager is not on site, act as the lead DFL interface, authority, and expert (deferring all non-routine incidents and inquiries to the attention of the DFL Manager)
- assist with DFL record-keeping, including user tracking and billing
- communicate and report all daily DFL observations to the DFL Manager
- advise the DFL Manager when consumables and tools need restocking and when machines need maintenance

DIGITAL FABRICATION LABORATORY STUDENT TECHNICIAN
(Non-key-holding and limited keycard authorization.)

- act as the first point of contact between students and faculty (and alumni and outsiders) and the DFL, directing users to appropriate first or next steps
- assist users with the DFL machines and enforce and uphold best practices and DFL policy and protocol
- assist DFL managers with general DFL operations and maintenance and with specified tasks
- assist DFL managers with the delivery of DFL orientations and training to students, faculty, and staff
- assist with the processing of user reservations and billing
- perform checks of digital file submissions and ensure fabrication readiness of submitted projects
- assist faculty with the fabrication of special research and workshops (with the permission of the DFL Manager)
- communicate and report all daily DFL observations to the DFL Manager or Assistant Managers
- act as a positive representative of the DFL and its explorative ethos within the student body

C. STUDENT TECHNICIAN HIRING STANDARDS

The DFL will hire student techs who meet the qualifications for access outlined in the Student Access Protocol. Prospective DFL Student Technicians, additionally, must demonstrate the following minimum qualifications:

**Software Knowledge**
- proficiency in Adobe Illustrator
- mastery of Rhino
- facility with learning software

**General Aptitudes and Attitudes**
- familiarity with woodworking principles
• facility with learning technology
• problem solving abilities and teaching inclinations
• qualities of leadership and professionalism
• active curiosity and willingness

Preference will be given to students who have taken Intro to the Digital Fabrication or Intensive Rhino Workshops.

D. STUDENT TRAINING PROTOCOL

New hires will attend a mandatory workshop in which they first will receive training on the lasers cutters - including safety, cleaning, maintenance and troubleshooting.

The workshops also will contain brief introductions and overviews of the 3D Printers and the CNC Mill; the training required to engage these later two machines, however, is intense and will occur throughout the student technician’s employment. Operating the 3D Printer and the CNC Mill requires advanced skills - the training for which continues for several semesters and is conducted by the DFL Manager, Assistant Managers, and veteran student techs. Only student techs authorized / certified by the DFL Manager are permitted to operate the 3D Printers or CNC Mills.

1ST YEAR OF EMPLOYMENT: LASER TECH

Upon Hiring, DFL Techs will be given an introduction to and overview of the Fabrication Lab. They will undergo training on the laser cutters covering its access, operating, and safety protocols. Techs are expected to display curiosity of the additional equipment and, during their 1st year of employment, will be trained to use the 3D Printer.

2ND YEAR OF EMPLOYMENT: LASER AND 3D PRINT TECH

Techs will continue to work on the floor of the laser lab and also will be given shifts in the 3D Printer Lab.

3RD YEAR OF EMPLOYMENT: LASER CUTTER, 3D PRINTER, AND CNC MILL TECH

Techs displaying technical acumen and proficiency will begin CNC Mill training in their second-year of employment and will shadow managers and veteran lab techs to learn the specific operating and safety protocols for the CNC Mill.

In the third-year of employment, only techs who illustrate mastery of the necessary software and prove that they can be trusted to operate the mill correctly and safely will be allowed to work as CNC Techs. Students never may operate the CNC Mill without an authorized professional staff member present.

In order to operate the milling table unsupervised, lab techs must demonstrate the following skills to the DFL Manager a minimum of fifteen times:

• ability to generate toolpaths for a profile cut
• ability to generate toolpaths for a surface mill
• understanding of co-relationships between the virtual model and actual mill work
• simulation of and checking for tool collisions
• understanding of feeds and speeds
• understanding of the properties of materials
• securing of stock properly and safely
• setting and checking the origin
• sequencing the machine properly
• knowing what to look and listen for while job is running
• cleaning-up

Student technicians then will have varying shifts with the following specific duties:

LASER TECH DUTIES

• General:
  - Make sure users show up for their reserved time and leave the machine when their reservation has ended.
  - Assist users with any questions they may have (which does not involve doing work for them).
• Safety Protocol Enforcement:
  - Ensure proper power / speed settings.
  - Ensure the user monitors his/her job until completion.
  - Ensure no harmful materials are used.
  - Ensure users remove and dispose of any scraps.
• Cleaning & Maintenance:
  - Clean all optics (lenses & mirrors). [daily]
  - Vacuum all small pieces that fall through the honeycomb. [hourly]
  - Fully wipe down machines, including all interior and exterior parts. [daily]
  - Delete all files from the desktop of the computers. [daily]
  - Sweep and dust lab. [daily]
  - Report any machine issues (unlevel bed, inadequate power, improper focusing, wiggly lines, etc) to DFL Manager or Assistant Managers. [as needed]

LASER AND 3D PRINT TECH DUTIES
Laser Tech duties, plus:

• General:
  - Send user jobs to the machine in an efficient and timely manner.
  - Assist users with any questions they may have (which does not involve doing work for them).
  - Contact users when their models are complete and ready to excavate.
  - Educate users on the various means of infiltrating a completed print.
• Cleaning & Maintenance:
  - Thoroughly clean entire build area, especially the cleaning station, printhead, and X and Y axes. [after every job]
  - Fully wipe down machine exterior. [daily]
  - Delete all files from the desktop of the computers. [daily]
  - Grease fast axis. [as needed]
  - Grease slow axis. [as needed]
  - Add powder and binder. [as needed]
  - Change printhead. [as needed]
  - Sweep and dust lab. [daily]
- Report any machine issues (missed layers on prints, low inventory of any consumables, maintenance alerts from the ZPrint software, etc) to DFL Manager or Assistant Managers. [as needed]

**LASER CUTTER, 3D PRINTER, AND CNC MILL TECH DUTIES**

Laser and 3D Print Tech duties, plus:

- **General**
  - Run jobs on the mill.
  - Meet with students for CNC consultations to ensure that they have set up their files correctly (which does not involve doing their work for them).
  - Provide advice on material selection and stock set-up.

- **Safety Protocol Enforcement:**
  - Ensure proper machine set-up.
  - Ensure proper and adequate feeds and speeds.
  - Ensure that all who enter the mill room wear ear and eye protection.

- **Cleaning & Maintenance:**
  - Ensure that techs perform a thorough cleaning of the entire mill room. [after every job]
  - Fully wipe down the machine. [after every job]
  - Grease all ball screws. [monthly]
  - Thoroughly clean all tool holders, collets, and end mills. [after use]
  - Empty moisture from the air compressor. [weekly]
  - Resurface the spoilboard. [as needed]
  - Delete all files from the desktop of the computers. [daily]
  - Report any machine issues (axis errors, Z-plunge, etc) to DFL Manager or Assistant Managers. [as needed]

**E. ASSISTANT MANAGER TRAINING PROTOCOL**

It is assumed that all personnel hired as the DFL Assistant Manager will be proficient in Adobe Illustrator and Rhino and that they will have past experience with laser cutters, 3D printers, and CNC mills. Given that, they will receive one-week of training on the laser cutters and the 3d printers and three-weeks of training on the CNC milling table to introduce Woodbury University expectations for:

- File Set-Up Standards
- Setting Standards
- Safety Protocol
- Facility and Machine Operations
- Regular Maintenance Procedures
- Reporting (Internal and External) Protocol
- Student Interactions
Woodbury University Digital Fabrication Lab Tech Contract

Once employed by the Digital Fabrication Lab, Techs (herein referred to as “DFL Techs”) will be expected to uphold certain standards to ensure their successful performance in their position. Please review this document and the DFL Protocol Handbook carefully in order to be sure you fully understand your responsibilities.

Grades
As a DFL Tech, you are expected to maintain good academic standing throughout the term of employment. Once hired, good academic standing is defined as a minimum 3.0 term GPA and a 3.0 cumulative GPA. If your GPA falls below a 3.0 during the term of employment, you will be expected to meet with your supervisor to develop an action plan to better balance academic and work responsibilities. It is also the option of your supervisor to terminate this contract.

Terms of Employment
DFL Techs will be hired for a term of one semester, with a performance evaluation taking place at each subsequent semester to determine ongoing employment.

Compensation
In exchange for the duties and responsibilities outlined in this agreement, DFL Techs receive a starting wage of $9.25/hour. If the DFL Tech remains in employment, they shall be entitled to a $0.25 raise each year.

Duties
DFL techs are to uphold the specific access, safety and operational protocols as stated in the DFL Protocol Handbook.

The following acts, if committed by a DFL Tech, will warrant consideration for immediate dismissal from the position and cancellation of all benefits of employment:

- Operating any equipment in ways deemed dangerous or not in accord with the protocols set forth in the DFL Protocol.
- Entering the lab during closed hours without the explicit permission of the DFL Manager.
- Using banned materials in any of the machines.
- An unexcused absence from a shift or being more than 10-15 minutes late to a shift 3 times.
- Refusal to comply with a reasonable request made by a supervisor.
- Violation of university policy, local ordinance, state statutes, or federal laws.
- Physical assault.
- Acts of negligence that cause reasonable doubt of satisfactory job performance.
- Behavior that reasonably can be considered damaging to the ability of the Office of Student Development, Maintenance, or any other campus department to meet its contractual responsibilities.
- Failure to comply with any of the conditions listed in this document or in the position description.

By signing below, I confirm that I understand that the DFL Tech position is second only to academics. I have read the position description and agree to the terms of employment as specified above.

______________________________          ________________
Print Name Clearly       Date
VII. EQUIPMENT AND OPERATION PROTOCOL

A. PER MACHINE SAFETY AND USE STANDARDS

The following expectations are minimums for the effective and safe maintenance and operations of the DFL Machinery. DFL management reserve the right to edit or add to this list at any time.

LASER CUTTER

The laser cutter is ideally used for precision cuts of complex geometries or for artful surface etching. The DFL will not allow use of the laser cutters for lazy cuts - such as rectangles, straight lines, or other simple geometries. Improper nesting and conservation of materials will factor into the lazy cutter category. Additionally, the machines must be used for academic purposes only - not for gifts or personal fluff. Be considerate of others and the time demands on the DFL.

USE

Files should be in RGB color mode in Illustrator. The default settings are:

- Cut = Red (R=255, G=0, B=0)
- Score = Blue (R=0, G=0, B=255)
- Etch = Black (R=0, G=0, B=0)

Using more colors or gray values, it is possible to create a more complex laser “drawing” - similar to the way that AutoCAD uses CTB files. Ask the DFL staff for project ideas.

Files may be transferred to the DFL computers via email, Dropbox, USB, etc. They will be deleted nightly; backup accordingly.

Always bring your own masking tape and bag or box in which you will carry your cut parts.

Always run a test cut. And, bring a journal to write down the material specifications and settings for reference for the next time you cut.

Never run the laser cutter without air assist and proper filtration.

Never, under any circumstances, is an operating laser cutter to be left unattended.

Do not leave behind any scraps or trash.

MATERIALS

Maximum material size is 24”x36”. Material thickness over ¼” is not recommended.

Acceptable Materials:
- wood products - for cutting: thin bass wood or wood veneers / for etching: all
- paper - mat board, chipboard, cardstock, single-ply cardboard, etc
- acrylic (Be sure that you are not using Lexan - a look-a-like of acrylic... It is much more toxic.) (All
other plastics must be pre-approved by DFL staff.)
• leather
• natural fabrics
• natural rubber
• anodized aluminum - which can be engraved into, but not cut

Unacceptable Materials:
• PVC
• lexan
• foamcore
• double-ply cardboard

Any material not listed here as acceptable or unacceptable must be pre-approved by the DFL Manager.

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EMERGENCY

If the machine malfunctions in any way, immediately notify the on-duty DFL lab technician.

In case of fire, use the closest fire extinguisher.

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3D PRINTER

The 3D Printers are for the rapid-prototyping of complex scalar forms and of component parts that cannot be otherwise fabricated. The DFL will not print simple rectilinear models or pieces. A DFL lab technician will otherwise direct you to the appropriate tool.

ZCorp

Files should be prepared according to the orientation specifications.

Files may be transferred to the DFL computers via email, Dropbox, USB, etc. They will be deleted nightly; backup accordingly.

If the machine needs powder, binder or a new print head, notify the on-duty DFL staff.

Salt water is provided for basic model infiltration. If you want stronger model finishes, you are required to provide CA (Zap-A-Gap) or laminating resin - available at Plastic Depot.

Do not leave any brushes, vacuum extensions, or anything else in the build area of the printer. (If the gantry becomes jammed due to such a lapse, you will be charged for the cost of the replacement motor.)

Infiltration is only to occur at the infiltration station.
If you are not present at the end of your appointment reservation, a DFL technician will excavate your model as expeditiously as possible. The DFL assumes no responsibility for damage to your model. You are the only one who knows the intricacies of your print.

Always wear a mask when excavating.

MATTER

Maximum build size is 8”x10”x8”. Minimum thickness is ¼”.

EMERGENCY

If the machine malfunctions in any way, immediately notify the on-duty DFL staff.

uPRINT+

USE

Files should be prepared according to the orientation specifications.

Files may be transferred to the DFL computers via email, Dropbox, USB, etc. They will be deleted nightly; backup accordingly.

On-duty DFL staff will add a new spool of material if needed.

Laboratory technicians must remove prints from the printer upon completion. This removal process must be done using heat-resistant gloves.

If you are not present at the end of your appointment reservation, a DFL technician will not bring your project to the bath for completion. The DFL assumes no responsibility for damage to your model. You are the only one responsible for the intricacies of your print and its washing.

WASH STATION

The wash station is located in our janitor service area. Prints will be bathed M-F between 12pm-4pm by a DFL technician and accompanying student(s).

Proper face shield and chemical gloves must be worn within a 10 ft. radius of the bath and drain. An alternative bathing solution called Eco-works can be used in the place of toxic chemicals. If used, bathing time takes a minimum of 1 day. The chemical used to wash parts can be hazardous to your health and if ingested or splattered in eyes requires communication with poison control. The janitor service area is off-limits to students when not accompanied by a laboratory technician.

MATTER

Maximum build size is 8”x8”x6” (build includes support material, scale down 90% from edges to verify fit). Minimum thickness is 0.01”
EMERGENCY

If the machine malfunctions in any way, immediately notify the on-duty DFL staff. Do not hesitate to pause or shut off machine if uncertain of machine behavior.

MakerBot

USE

You are responsible for modeling both your model and your own support material.

Files should be prepared according to the orientation specifications.

Files may be transferred to the DFL computers via email, Dropbox, USB, etc. They will be deleted nightly; backup accordingly.

Do not touch anything within the build area when the machine is on. Surfaces and nozzles are very hot.

MATTER

Maximum build size is 8.9"x5.7"x5.9". Minimum thickness is 1/32".

Print in a variety of colors and up to two per project. Alternatively, it is possible to print in one color plus a dissolvable support material.

Fine resolution is achievable at the expense of material and time.

EMERGENCY

If the machine malfunctions in any way, immediately notify the on-duty DFL staff.

CNC MILLING TABLE

The ideal use of the CNC Mill is the fabrication of 1:1 objects and parts (building elements and furniture). The DFL will however mill the exceptional scalar representation or site model - though, this project type is not to exceed 9 square feet. With instructor consent, larger group projects will be considered - though, material stock will be limited to foam.

USE

Files should be prepared according to the orientation specifications.

You must arrive at your CNC consultation with toolpaths already generated in RhinoCAM. The
toolpaths will be reviewed during the consultation and the CNC technician will assist you with any necessary corrections. The DFL staff do not expect perfectly generated toolpaths. The DFL staff is happy to help you learn CNC technology, not to do your projects for you.

Files may be transferred to the DFL computers via email, Dropbox, USB, etc. They will be deleted nightly; backup accordingly.

Always wear proper ear, eye, and respiratory equipment (provided by the DFL) when in the vicinity of the operating CNC milling table.

You are required to monitor the machine and be present throughout the running of your project.

Only qualified DFL staff will operate the CNC Mill.

The mill is never to run with only one person present, period.

Do not enter the mill room while the machine is running without the consent of the on-duty DFL technician.

Students must sweep and vacuum at the end of each project phase (even under the table bed).

**Employees Only**

Tools are not to be left in the spindle and must be ejected at the completion of each project phase.

The machine should be homed and powered-down after each project.

Do not move the Los Angeles gantry without first turning on the air compressor.

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**MATERIALS**

Maximum material size is 4’x8’ (x10” minus bit length).

Projects smaller than 1’x1’ do not have enough surface area for the vacuum to hold the material to the table and are not a suitable milling project.

In order for sheet material to be cut, it must be perfectly flat. Do not buy cheap, warped products and insure that your material is stored flat. If the vacuum will not hold the material to the bed, it will not be cut.

Do not laminate your stock prior to your CNC consultation. There are special techniques that reduce mill time and material waste. Under no circumstance will your job be run if the DFL is milling away more than 60% of your stock.

Do not screw into the spoilboard without the consent of the on-duty DFL technician.

Acceptable Materials:
- any solid wood
- plywood
• formaldehyde free MDF
• acrylic
• most plastics
• foam

If milling MDF, you must provide proof (a receipt) that it is formaldehyde free - available at Phillip’s Plywood.

Unacceptable Materials
• cardboard and chipboard
• MDF with formaldehyde
• metal

Any material not listed here as acceptable or unacceptable must be pre-approved by the DFL Manager.

EMERGENCY

If the machine malfunctions in any way, immediately notify the on-duty DFL staff.

In case of machine hiccup, hit “pause” - the black button on the machine. In case of emergency, hit “stop” - either the red button on the machine or the wall. (Through the “pause” action, the job can be reset; through the “stop” action, the job is not recoverable.)

In case of minor injury, alert the on-duty staff and make use of the provided first-aid kit. In case of severe injury, dial 911 immediately.

B. MAINTENANCE CHECKLIST

ALL MACHINES

• renew all machine warranties annually
• maintain facilities and machine logs

LASER CUTTER

• clean all motion rails (after every use)
• clean all optics (daily if needed)
• Vacuum any debris (after every use)
• grease ballscrews
• make sure tables are level (monthly)
• change Purex filters (as needed)
• empty moisture from the air compressor (Universal only)
• ensure proper beam alignment (monthly)

ZCORPS 3D PRINTER
• clean build area (daily)
• clean cleaning station (after every use)
• add ZC10 when dry
• remove all brushes and vacuum extensions from build chamber
• ensure sufficient levels of powder and binder
• keep software up to date
• vacuum excess powder from depowdering area
• clean printhead and replace when needed
• grease all axes when needed

uPRINT+ 3D PRINTER

• empty purge tray (after every use)
• clean build area (after every use)
• empty water & clean bathing station (after every use)
• keep software up to date (per semester)
• clean printhead and replace when needed (every 500hr +- every year)
• change heating extruders (every 2000hr +- every year)
• re-calibrate printer (when needed or every semester)

CNC MILL

• ensure spoilboard is surfaced and holding down adequately (as needed)
• grease all ball screws (monthly)
• empty moisture from air compressor (daily)
• clean all tools, collets and tool holders (daily)
• tighten all bolts, screws etc when loose (monthly)
• clean and grease all bearings (monthly)
• blow out all filters in motor
• ensure software knows toolstand locations
• empty dust collector bags when full
• keep mill room clean
• dispose of dull or blackened tools
• check regularly for damage to tool holders and collets

C. INVENTORY OF MACHINES AND TOOLS

A log of incidents will be maintained for the facility and for each machine.

LOS ANGELES

(1) Universal ILS 9.75 Laser Cutter
(2) Epilog Legend 36 EXT Laser Cutters
(4) Purex Filtration Units

(1) Zcorp Zprinter 350 (now 3D Systems)

(1) Techno LC 4896 CNC Mill
(1) Universal ILS 9.75 Laser Cutter
(1) Purex Filtration Units
(1) uPrint+ by Dimension
(1) AXYZ 4008 Series Router

D. MATERIAL STORAGE

The Digital Fabrication Laboratory has minimal storage. In turn, no user materials may be stored on
the premises. The only materials that the Digital Fabrication Laboratory will store on the premises are
supplies for orientation and training.

VIII. DIGITAL FABRICATION LABORATORY COSTS

Under development.

IX. ADDITIONAL RESOURCES AND TUTORIALS

Under development.

X. CONCEPT OF FABRICATION AND MAKING IN THE CURRICULUM

Fundamental to its Fieldwork agenda, Woodbury School of Architecture is committed to nurturing an
enterprising design practitioner. By facilitating first-hand exposure to and experience with making and
thinking role models, it aims to convey to students the perspective and skill necessary to realize their
own imaginings. The technology facilities on both campuses are integral contributors in this enabling
education. And, technology, here, is an inclusive term, one that reinforces interdependencies between
analog craft and shop work, of computing, and of rapid-prototyping processes.

To this end, (digital) fabrication is introduced as a synthesizing force for the traditional engagements
of the hand and the tool, the virtual visualizations of the mind, and the contemporary systems of
production. Herein, digital fabrication, as an extension of its predecessor technologies, necessarily
incorporates and relies upon all approaches to design development. It collapses all phases of a
project into each other, linking the means of conceptualization to those of simulation and testing
to those of manufacturing. A digitally fabricated product simultaneously contains the knowledge of
the material response to the mechanized actions of a machine to the coded communications of a
computational representation of an initiating idea. And, the relationships between these prompts are
neither closed nor linear; they benefit, even depend upon, interruptions to technique and shuffles in
methodology.

Because of this enfolding and holistic reach across the expanse of design, digital fabrication is an
opportune seat for expertise building. In a digital fabrication sequence, varieties of intelligence are
cultivated in the doing:

1. Digital Input. As with all design projects, a digitally fabricated product begins with an idea. In
a digital fabrication project, however, the idea must transition through multiple media platforms in order to manifest. To begin, the idea is translated into a computerized geometry by one of two primary means. The first, whether literally the intuitive compositions of the pen on paper or the mimicking thereof, is the visual output of formal manipulations of matterless lines and surfaces on a sheet or screen. The second, that of the parametric, increasingly calls upon a thorough understanding of mathematics, physics, and coding as the generators of information-imbued, responsive shapes.

2. Feedback Loop. By whichever route a data object is created, the computational byproduct is actionable - both within the virtual and material worlds. A manifestation of a complex script, a digital model either embodies, is receptive to, or commands performance - either as simulation or as technological response. Increasingly sophisticated software analytically measures and sensorially imitates behavioral properties of and within hypothetical mediums - from acoustics, to corrosion, to gravity, to refraction. Through another translational step and interface, the same file then becomes the instructions for the actual productive reactions of increasingly dexterous additive and subtractive hardwares. Additionally, the gap between the coded base prompt and the physical output increasingly is eliminated through the development of intelligent building components - that bend and form, open and close, turn on and off in connection with programming triggers or environmental queues processed as programming triggers.

3. Material Output. Then, there are products - in the most traditional sense of the word - at every stage of digital fabrication - from the two-dimensional depictions and representations of the content of a digital file, to the construction and manipulation of the fabrication machine and console, to the destination “thing”. These multiple yields are multiple measures - aesthetic and compositional, processual and technological, phenomenological and physical - that iteratively influence each other. The endless reciprocations between the various outputs encourage both familiarity with and contamination of the architectural design to manufacturing chain. Additionally, each of these fabrications, at the moment of manifestation, are no longer digital - are, in turn, primed for, even demand, external and hybrid manipulations.

Digital fabrication, then, is a term that collapses together all of the means of making. Its competent execution requires facility with scientific principles, with computer language and softwares, with electronics and mechanics, and with industrial processes. Its beautiful realization requires critical conceptual grounding, sensibilities for art and craft, and familiarity with material properties. Its practical application requires awareness of production economics and standards. Its innovative development requires an experimental - make and break - ethos. And, together, these quality demands contribute to the making of a capable and empowered designer.

Because Woodbury School of Architecture understands digital fabrication in the aforementioned terms and as a conduit to disciplinary and individual advancement, it is particularly interested in the D.I.Y. and open-source movements within the field. It embraces an intentional dissemination of both the skills and the tools as a device for exposing designers to the potentials and the potentials to designers.