

DIGITAL DESIGN & FABRICATION LAB
School of Architecture, AUTH

REGULATIONS AND TERMS OF USE

2013-14

1. Title and Subject of the Lab

The Digital Design & Fabrication Lab provides 3D printing and rapid prototyping services to students, staff members of the School of Architecture, AUTH, and research groups that are interested in the 3D representation or digital fabrication of objects. The main objective of the Digital Design & Fabrication Lab is to establish a connection between design and manufacturing through the use of 3D modelling software and computer controlled fabrication machines. These tools allow designers to produce physical artefacts directly from digital models, to test their accuracy, and to evaluate their proposed object prior to its construction. Furthermore, they introduce new ways of approaching architecture through its direct connection to materiality and the construction process that gives continuous feedback to design in a bottom-up fashion.

The Digital Design & Fabrication Lab operates on the 2nd Floor of the School of Architecture in the Faculty of Engineering, AUTH. Its areas cover a total of 280m² and include three major rooms: the Printers Room, the Hardware (equipment) Room and the Seminar Room. Its equipment covers the following digital fabrication and printing systems:

1. 3D laser scanning
2. 3D printing and prototyping
3. CNC cutting and milling
4. Laser cutting
5. Printing

2. Teaching and Technical Staff

Administrator: Stavros Vergopoulos, Assistant Professor.

Committee: Maria Voyatzaki, Associate Professor, Anastasios Tellios, Assistant Professor. Technical Support: Konstantinos Pavlides, Vassilis Zafranas, Technical Assistants.

The staff is responsible for preserving the housekeeping and to ensure the proper use of its equipment. The technical staff is responsible for the operation of the machinery and its safety.

3. Opening Hours

The Digital Design & Fabrication Lab is open daily, 10:00-15:00. During the exams, it extends its opening hours to 16:00. In the event of an intensive design workshop, the Digital Design & Fabrication Lab can extend further its opening hours provided that the member of the staff organising the respective workshop takes full responsibility for the supervision and the operation of the equipment, the security and safety of the Lab areas, and the protection and safety of the users.

4. Users and Operation of the Equipment

4.1 There are six (6) different categories of users:

1. Undergraduate students and members of the teaching staff from the regular program of studies of the School of Architecture, AUTh.
2. Undergraduate students and members of the teaching staff from design workshops that are organised in the School of Architecture, AUTh.
3. Undergraduate students who undertake their Design Diploma Project in the School of Architecture, AUTh.
4. Postgraduate students who attend one of the postgraduate programs of studies or are registered for a PhD in the School of Architecture, AUTh.
5. Students and members of the teaching staff who attend educational or research programs.
6. Professionals and users outside Aristotle University of Thessaloniki, with the permission of the School of Architecture, AUTh.

4.2 The equipment is operated exclusively by the technical staff that is responsible for its proper usage and operation.

Users are not allowed to operate the machinery by themselves without the supervision by members of the technical staff.

Users are responsible for the preparation of the data that contain the items that are going to be printed, according to the instructions given by the technical staff. This should be made prior to the fabrication time. The members of the technical staff are responsible for providing the users with the corresponding software (drivers) and other necessary information to convert CAD geometry into formats recognisable by and compatible with each machine.

Users are exclusively responsible for any software failure either in the files containing the geometry that is going to be printed or any other lack of information and they are fully liable to any service costs.

4.3 The use of machinery is regulated by the allocation of points that correspond to each machine. The points take into account the operation time, the cost of use, and the cost of consumables according to the type of construction. The assignment of points to each machine/work takes also into account the popularity of each machine. The use of machines that are not that popular corresponds to fewer points.

Users, according to the category to which they belong, may purchase cards with points from the secretariat/staff of the Lab. Users can apply for the use of specific hardware and points on specific days and hours, to the secretariat/staff of the Lab or online on the Lab website. Indicative usage tables for each machine can help users to schedule their work and complete the relevant applications.

According to this correspondence, each user (or user group) can redeem the points attributed to the machine of choice (i.e.: 10 points in laser cutter or 40 points 3Dprinter). Points are assigned to each fabrication work in the laboratory at the end of the work when technicians invalidate the corresponding points. In this way, the mistaken allocation of points due to a false prediction is avoided. Yet, the staff of the Lab may refuse the use of a machine when the time of operation exceeds significantly the initially requested time.

For a more balanced use of the equipment there are three (3) periods of use per semester, which are reflected in the corresponding points of use:

First period (beginning of semester, week 1-4),

Second period (middle of semester, week 5-10),

Third period (end of semester, week 11-13).

The use of a specific machine in the beginning of the semester corresponds to fewer points than at the end of the semester (i.e.: 10 minutes of operation of the laser cutter at the beginning of the semester corresponds to 60 points while the same minutes at the end of the semester –peak time- corresponds to 80 points).

4.4 The mode of fabrication of different machines broadly divides them into the machines that work by material subtraction (machines that cut, drill, mill and generally remove material from a volume) and the machines that work by material addition in layers (machines that "build" a volume by adding continuous layers of material or polymerizing material).

Each user is exclusively responsible for the supply of the materials used by machines that operate through material subtraction. Widely used materials may be found in the Lab but their availability has to be checked first. Usually, these materials are cheap and accessible on the retail market: cardboard, MDF boards, polyurethane blocks, plywood, etc.. The specifications of these materials are described in specific tables that are available for each machine.

The materials used by the machines that operate through material addition are usually specific resins and are supplied exclusively by the technical staff of the Lab. Their cost is taken into account in the points of use of the corresponding machinery.

Users are exclusively responsible for any damage caused to a machine through inappropriate use or non-prescribed material. Users are also exclusively responsible for the removal of any waste and debris in the areas of the Lab after every work.

4.5 In the case of excessive demand there is a provision for the allocation of points of use to specific user categories during the semester, so that a program of use is attained. In other words, particular categories of users may be given priority to the use of specific machines. Users can apply for the distribution of points of use at the beginning of each semester. Applications are completed by the end of the first period of operation (end of week 4 of the semester). Changes in the program of use can be made by the end of the second period (end of the week 10 of the semester).

The distribution of points of use is never personal (per student) but is always assigned to a specific category of users, based on requests from the teacher in charge of each course, workshop or program. The teacher is then responsible for the distribution of points among the students that attend the course, workshop or program.

Exceptions constitute the cases of students who work towards the completion of diploma projects or research dissertations, who can be credited personal points, in collaboration with the supervisor in charge, taking into account other demands and jobs in the Lab.

4.6 The machines have a varied degree of demand, frequency of use and cost.

The following list shows a rate from the most popular to the least popular machines.

1. Laser Cutters
2. 3D Printer (Powder)
3. CNC Router & Milling
4. Vacuum Former
5. 3D Scanner
6. 3D Builder (PLA plastic)

The following list shows a rate from the lowest to the highest cost of use.

1. 3D Scanner
2. Vacuum Former
3. Laser Cutters
4. CNC Router & Milling
5. 3D Printer (Powder)
6. 3D Builder (PLA plastic)

5. Financial Management, Operating Expenses, Maintenance and Materials

The allocation of points of use foresees the operating cost, the maintenance cost and the cost for the purchase of materials. Users are not charged additional points with the exception of the supply of materials, if applicable. The assignment of points of use to currency can change according to the expenses above. Yet, for better planning, these changes are made at the beginning of each semester.

The use of certain machines of the Digital Design & Fabrication Lab can be granted to Research and Educational Programs (such as programs of "Lifelong Learning") or non-academic institutions (such as TEE) through a specific agreement between AUTH School of Architecture and the respective institution. This agreement takes into account the type, time and cost of use.

TABLE OF SPECIFICATIONS OF THE MACHINERY OF THE DIGITAL DESIGN & FABRICATION LAB

1. 3D PLA Rapid Prototyping Machine.
Max prototype dimensions 260*160*90 mm, tolerance 0.2 mm.
2. Monochrome 3D Powder Printer.
Max prototype dimensions 200*250*200 mm, tolerance 0.1 mm.
3. 3axis CNC Router & Milling Machine.
Max movement dimensions 1500*900*300 mm.
4. Thermal Vacuum Forming Machine.
Max sheet dimensions 650*650 mm.
5. Laser Cutter, 40W.
Max dimensions 450*610 mm.
6. Laser Cutter, 60W.
Max dimensions 700*1000 mm.
7. 3D Scanner.
Max distance 50-3000 mm, tolerance 50 µm.
8. Enroute, software for the analysis, the evaluation and the construction of 3D objects and reliefs.
9. Leios, reverse engineering software.
10. Big scale colour and monochrome plotters and printers.

ALLOCATION OF POINTS OF USE TO HARDWARE/WORK OF THE DIGITAL DESIGN & FABRICATION LAB

Work – Machine		Points of Use (p)
1. A4 Printing or Photocopy		1 p
2. A3 Printing or Photocopy		2 p
3. A2 Printing or Photocopy		4 p
4. A1 Printing or Photocopy		8 p
5. A0 Printing or Photocopy		16 p
The cost of printing is multiplied by 2x if the coverage in ink is 50%		
The cost of printing is multiplied by 4x if the coverage in ink is 100%		
6. 3D powder printing	1cm ³ (1x1x1cm)	20 p
7. Vacuum Forming	1/2h	60 p
8. CNC router or milling	1/2h	120 p

For the academic year 2013-14: 1p=0,05€ (for all periods of use)

IMPORTANT SAFETY RULES AND INSTRUCTIONS

1. All equipment and machinery are operated exclusively by the allocated technical staff of the laboratory.
2. Students and individuals that are not involved in fabrication works are not allowed to remain in the areas of the Lab.
3. Nobody is allowed to remain within the enclosed area of the CNC machine during operation.
4. Fabrication and construction works other than the ones carried out by the machinery are not allowed within the areas of the Lab.
5. **The use of spray, glue, varnish and paint products is strictly prohibited within the Hardware Room of the Lab.**
6. **Smoking is strictly prohibited within the Hardware Room of the Lab.**