What is Fab Academy?

The Fab Academy program teaches principles and applications of digital fabrication. It’s a fast paced, hands-on learning experience where students learn how to envision, prototype and document their ideas through many hours of practical experience with digital fabrication tools. Fab Academy is based on MIT’s popular rapid-prototyping course How To Make (almost) Anything, taught by Prof. Neil Gershenfeld.

The program consists of a 5 month intensive training, from January to June. During this time, students plan and execute a new project each week, together with a final project, a prototype that can be implemented eventually, after the end of the program.

Fab Academy Structure

Fab Academy offers a distributed rather than a distance educational model: students learn in local workgroups, with peers, mentors, and machines, which are then connected globally by content sharing and video for interactive classes. The individual Fab Labs, Nodes, are supported and supervised regionally by Supernode sites with more advanced capabilities, expertise, and inventories.

Each Fab Lab that participates in the Fab Academy program is part of a global Fab Academy network linking more than 70 Fab Labs throughout 5 months of project collaboration.

Students view and participate in global lectures broadcasted every week. In addition, they receive each week hands-on instruction provided by the Instructors of their local Lab, where students have access to the digital fabrication equipment and personal help with projects. Fab Academy Faculty, who are leaders in their respective fields, provide global video lectures, supervise academic content, and guide research. Local Instructors supervise and evaluate student’s progress, develop and disseminate instructional material, and assist with projects.

The methodology and network first developed in the Fab Academy platform has subsequently been used to add classes, collectively called Academany, that share the model of hands-on instruction to students in workgroups, with local mentors, linked by shared content and interactive lectures by global leaders.

The Academany is a global distributed campus for high level education, with hundreds of locations all over the world.

“All in all, the Fab Academy has been an awesome experience. This huge bandwidth of fabrication methods consolidated in one spot is really great.”

Marco Wehrfritz, FA 2017 student at Fab Lab Skyline College, San Bruno - CA, USA
Following an initial trial in 2008, the Fab Academy accepted the first Diploma students in the Fall of 2009. Since then, the amount of students enrolled in the course have steadily grow in around 40 to 20% per year. Fab Academy numbers since 2009:

- **1,139 Students enrolled**
- **606 Students graduated**
- **183 Nodes that offered the program**
- **45 Countries that offered Fab Academy**

From 2009 until now, the following countries have offered the Fab Academy program:

- Argentina
- Austria
- Bahrain
- Brazil
- Canada
- Chile
- China
- Colombia
- Costa Rica
- Denmark
- United Arab Emirates
- Ecuador
- Egypt
- Ethiopia
- Finland
- France
- Germany
- Ghana
- Iceland
- India
- Ireland
- Israel
- Italy
- Japan
- Kenya
- Korea
- Kuwait
- Mexico
- Namibia
- Netherlands
- New Zealand
- Norway
- Peru
- Portugal
- Russia
- Rwanda
- Saudi Arabia
- Singapore
- South Africa
- Spain
- Sweden
- Switzerland
- United Kingdom
- Uruguay
- USA
Fab Labs began as an outreach project from MIT’s Center for Bits and Atoms (CBA), and spread around the world. The Fab Academy was launched to provide access to advanced instruction for students in these labs exceeding the educational resources locally available to them. Fab Labs became the platform in which this access spread throughout the whole network.

Fab Labs that offer the Fab Academy program are Nodes.

Fab Academy Nodes are Fab Labs that fulfil the requirements to offer Fab Academy. Those requirements are:

- Qualified staff: Fab Labs need trained people in order to offer Fab Academy and this training is the program itself. To instruct Fab Academy you need to have taken Fab Academy program.

- Physical Infrastructure: Fab Labs must insure access to all the equipment and materials listed in the Fab Inventory.

The evolution in number of Nodes over the last several years shows a constant growth, starting with 12 Fab Labs in 2010 and reaching and exceeding 70 in the last two years.
Node’s distribution

The first edition of Fab Academy took place in 2008 when 8 students took the MIT’s MAS863 class with Prof. Neil Gershenfeld.

Back then, the remote nodes taking the class were Barcelona, Amsterdam, Iceland and Norway fab labs. In 2017, Fab Academy took place in 73 Nodes, most of them located in Europe and Asia.

- 25 in Europe
- 18 in Asia
- 11 in Central and South America
- 10 in North America
- 5 in Middle-East
- 3 in Africa
- 1 in Oceania (New Zealand)

Fab Labs that offered Fab Academy in 2017
While in the first years of the program (2009/10) Fab Academy was mostly offered by European and Latin & North-American Fab Labs, now there is a considerable presence of Fab Academy in the rest of the continents.

Since 2013 we have witnessed the emergence and consolidation of Middle Eastern, South Asian (Indian) and East Asian (Chinese and Japanese) Nodes.

This behaviour may correspond with the rise of the maker movement in these countries and in the case of East Asian labs, with the hosting of Fab12 Conference in Shenzhen, in 2016.

African Nodes have had a steady presence in the course since the beginning, ranging from 2 to 3 active nodes per year.

**Node’s size**

Maintaining the dynamic growth of the previous years, in 2017 Fab Lab Barcelona was the largest Node in number of enrolled students, 30, followed by Fab Lab Kuwait (14) and Fab Lab Veritas, Costa Rica (10). In 2017, the average number of students per Lab was 4.

In the earliest years of Fab Academy (2009 to 2012), the Fab Labs with the most enrolled students were Nairobi (Kenya), Vestmannaeyjar (Iceland) and Lima (Peru), with 14, 12 and 10 students. Starting from 2013 and consolidating in 2015, the average number of students grew significantly, especially in the biggest Nodes: Fab Lab Barcelona (Spain) reached 36 students enrolled, As220 (Providence, USA) 18 students and Amsterdam, (The Netherlands) 16 students.

In 2017, 285 students enrolled in the Fab Academy program (out of 462 applicants), growing 16% compared to 2016.

The evolution in the number of students joining Fab Academy during the last 7 years shows an exponential growth, starting from 30 students in 2010 and reaching, a number 10 times bigger for 1017.

**Students graduated**

After the completion of the 20 certificates comprising the course, students are awarded with the Fab Academy Diploma, which ceremony traditionally takes place during the annual Fab Lab Conferences.

In 2017, out of the 285 students enrolled in Fab Academy, 184 graduated from the program.

“Thanks for this course because I increased my knowledge and confidence.”

Anonymous, FA 2017 student
**Student’s profile**

The average age of the students enrolled in Fab Academy in 2017 was **31** years old.

Our Fab Academy students and graduates come from highly diverse backgrounds. So far, we’ve had architect, industrial, product, fashion and graphic designer, artist and artisans, different profiles of engineers (industrial, civil, mechanical, electronics, telecommunication and computer), biologist and chemist; high school, bachelor, master and PhD students, and a large etcetera.

Analyzing the gender distribution of the students, in the last years of the program around 25% of the applicants to Fab Academy were women and 75% males.

**Student’s geographical origin**

Analyzing the origin of the students that joined fab Academy in 2017, **Indian** students make up the majority of the cohort with **39** students. The second largest group includes students from the United States (20 students), Spain (17), Italy and Peru (16); followed by Kuwait (14), China (13) and Egypt (12).
During Fab Academy, each student must prove mastery of the skills gained during the program by developing a Final Project, a prototype to test an idea.

Among the wide variety of project proposed by students in 2017, we had different types of robots and vehicles (rovers, rotating and balance bots, drones, robotic arms, karts, motorized skates, a fabbable car, etc.), musical instruments, security systems, interactive toys and games, smart furnitures, wearable devices and different kind of objects (alarms, lamps, etc.) featured with sensors.

Students prototyped fabbable machines (CNC, 3D printers, cutting, molding and hole machines), growing systems for plants, water filters, pet's feeders and devices for medical care or for helping people with some disability.

The documentation of these projects is open and available to anyone in the Fab Academy Class Archive.

**2017 Featured Projects**

Below, the list of the featured 2017 Final Projects, selected by the Fab Academy Director, Prof. Neil Gershenfeld.
Palla

It’s a multi-terrain robot. The 200 mm diameter sphere moves by rolling and it’s controlled through a phone app.

Pietro Rustici - Fab Lab Toscana

Hector - Luggage sized CNC platform

It’s a portable CNC milling machine that fits in the airplane luggage. The motion system can be milled from aluminium and POM (Delrin) sheet stock. All the electronics, except the motors, can also be made in a Fab Lab.

Jakob Nilsson - Fab Lab Verket

Plexi LED Guitar

It’s a guitar with kill switch and sound sensor that effects LED lights, which illumine engraved plexiglass.

Birkir Thor - Fab Lab Hornafjördur
Hello Happy Plant

It’s a system to communicate with plants and identify if they are thirsty. After putting the device inside the flower pot, the user selects the type of plant: humid, normal or dry. If the LED is ON, means that the plant needs water.

Blanca Rosas - Fab Lab Amsterdam

Vac-Former

It’s a small sized vacuum former. It uses a thermistor that detects the temperature, and when it’s optimum for the plastic material, the light and sound indicators inform that the plastic is prime for vacuum forming.

Louis Goh - Fab Lab Singapore

Fab Saver

It’s a light saber, featured with capacitive input crystal to define the color’s blade to match the side of the force...

Rodrigo Diaz - Fab Lab Seoul
Open Hydroponic Growsystem

It’s an hydroponic growbox, which can be completely manufactured in a Fab Lab, featured with different sensors. The aim is to measure, control and represent the air humidity, lighting, pump, temperature and the water level of the nutrient solution, in order to find an effective way to plant herbs and salads all year round without consuming a lot of space.

Marcel Kellner - Fab Lab HRW

Easy Tester

It’s a portable device with SMD measuring capability, with easily detachable tweezer probes for testing on board components and leaded components. The measurement is displayed on a LCD display.

Ajith Kumar M G - Fab Lab Kerala Trivandrum

Fab Wheel - The Walk Work Wheel

It’s a giant hamster wheel. It combines with a standing desk to have active workspace. To keep track of the workout, the Reed sensor measures the rotations and send data to an Android device via Bluetooth, in order to be displayed in a mobile app.

Jim J Seelan - Fab Lab Kerala Trivandrum
Rocking Robot

It’s an intelligent robot for kids. It is controlled by a mobile, through Bluetooth. Its main functions are: auto balance, object recognition and track, voice distance broadcast and speech recognition.

Shenghong Cao - Fab Lab Beijing

FINANCIALS

Fab Academy is a distributed educational program supported by Fab Foundation and globally coordinated by Fab Lab Barcelona.

Fab Foundation is a non-profit organization that emerged from MIT’s Center for Bits & Atoms Fab Lab Program, formed in 2009 to facilitate and support the growth of the international fab lab network. Its mission is to provide access to the tools, the knowledge and the financial means to educate, innovate and invent using technology and digital fabrication to allow anyone to make (almost) anything, and thereby creating opportunities to improve lives and livelihoods around the world.

Fab Lab Barcelona, part of the IAAC Foundation, is one of the leading Fab Labs in the EU, focusing its activity in educational and research programs related with the multiple scales of the human habitat and the self-sufficiency agenda. It is the headquarter of the Fab Academy Global Coordination, supporting Fab Labs, Mentors, Instructors and students throughout the course.

Fab Academy cost structure

The Fab Academy program receives all its financial support from the fees of the students enrolled in the course.

The content from Fab Academy is free, all the classes and project documentation are available for anyone in the class archive. Students fee covers the set of services attached to the program such as instruction and support, evaluation, hosting of documentation, among others.

The program tuition fee is based in the combination of 2 costs:

- **Local Costs** - The costs needed to run the course in the local Fab Lab that hosts the program.
- **Central Costs** - Infrastructural costs and services provided by Fab Academy Global Coordination and Administration.

The price for Fab Academy 2017 was 5000 $/€, 50% Central Costs, 50% Local Costs.
The Local Costs cover:
- Materials for projects.
- Access to facilities.
- Operations (such as running the class, placing orders, scheduling meetings and tracking students).
- Instruction (individual technical guidance).

The Central Costs cover:
- Administration (common costs across classes, including managing finances, running logistics, keeping records, and supporting servers).
- Operations (regional supervision, mentoring and direct support for the class such as recording its videos).
- Faculty (preparing and delivering the lectures, running global reviews).
- Student support (review and accreditation of student work, registration for graduation at the FABx events and contributions towards scholarships).

For Fab Academy 2017, Administration is composed by two branches:
- Europe Administration, that manages central costs for Fab Labs located in Europe.
- USA Administration, that receives payments for Fab Labs located in located in America, Asia, Africa and Oceania.

Both Administrations receive, with some exceptions, the large part of the students fees and reimburses the Nodes for their Local Costs, as well as redistributes the fees corresponding to the remote support of mentors.

In 2017 Fab Academy Administrations received 753,000$, reimbursing around 270,000$ in concept of Local Costs and Remote mentoring. The rest of the income, Central Costs, were distributed in the categories listed in the chart:
**Fab Academy Scholarships**

Central Coordination & Administration waives total or partial portions of the Central Costs to cover partial scholarships for Fab Academy tuition fees, to help students with economic difficulties. Full scholarships are the combination of both Central and Local efforts to help students with excellent academic backgrounds that cannot afford the costs of the course.

In 2017, Fab Academy granted scholarships for 125,000$ to 60 students. In total, 157 students received some kind of funding, either by Fab Academy Central Coordination and / or their local Fab Lab, or Private Donors.

**Scholarship distribution**

Fab Academy Central Coordination scholarships can be categorized as follows:

- Full and partial scholarships for specific cases: granted to specific students.
- Subsidized fees: fees reduction for all the students in the Node.
- Highly subsidized fees: fees reduction of more than 75%, for all the students in the Node.

**Number of Nodes per Type of Funding Received by their Students in 2017**

- **Nodes with Highly Subsidized Fees:**
  - India (5)
  - Egypt (1)
  - Kenya (1)
  - Rwanda (1)
  - South Africa (1)

- **Nodes with Subsidized Fees:**
  - Russia (1)
  - Israel (1)
  - Costa Rica (1)
  - Mexico (1)
  - Ecuador (1)
  - Chile (1)
  - Brazil (1)

- **Nodes with Scholarships for Specific Cases:**
  - Germany (1)
  - Switzerland (1)
  - Italy (1)
  - Spain (1)
Analyzing the scholarship status per geographical area, the following conclusions can be drawn.

In Europe, 12% of the students were granted a scholarship by Fab Academy Central Coordination, while 51% of them received funding by educational institutions (Universities, Fab Labs, etc.).

In the case of North America, 33% of the students received some kind of scholarship, all of them were conceded by local Labs. In Central and South America, 68% of the students that received a scholarship were founded by educational institutions, while the rest were funded by FA Central Coordination.

In South Asia, most of the students received some kind of funding: 76% of the students received a scholarship from Fab Academy Central Coordination and 49% of them were granted a scholarship by their Lab or private institutions. In China and Japan the scholarships were exclusively granted by educational institutions (39% of the students).

In Middle East, Egypt, and Israel 100% of the students were totally or partially founded by Fab Academy Central Coordination. In the case of Dubai and Kuwait 100% of the students received a scholarship granted by private companies.
FAB 13 Graduation Ceremony

FAB13 - Fabricating Society was the 13th international Fab Lab Conference, that took place in Santiago, Chile, from July 31th to August 6th, 2017.

The inaugural conference, reserved for the members of the network, was attended by around 700 participants, followed by 850 people during the symposium and closing with close to 20,000 visitors for the Fab Festival weekend.

The Fab Academy Graduation Ceremony took place in August the 2nd, during the event. 63 graduated students travelled to Chile to receive their diploma in person and attend the weeklong celebration of digital fabrication.
With the increasing access to the use of digital tools and systems in the world of fabrication, biology and design, the possibilities to solve problems locally has expanded. In this context, Academy. The Academy of (almost) Anything, offers access to high level education all over the globe, at connected sites offering common infrastructure to all students, who share knowledge in an open and peer-driven environment.

Current classes are the Fab Academy - How to Make (almost) Anything, the Fab Academy X, an adaptation of Fab Academy to local ecosystems, and the Bio Academy - How to Grow (almost) Anything, a course teaching the applications and implications of synthetic biology, launched in 2016.
In 2017 Academany launched the short course *Why to make (Almost) Anything*, by the acclaimed artist Olafur Eliasson. The program focuses on the *why* of making instead of giving people command of the tools for making or growing (almost) anything. It was a series of lectures, programs and projects all revolving around the subject of why to make.

One of these projects was **Smiling Works**, which aimed at motivating people to smile more. The groups involved in the course created a series of projects such as:

- **Donate your smile**: A campaign for donating to a charity institution for each smile recorded by people in a public space.
- **Smile-vending-machine**: Give merchandise (like chewing-gum) to children smiling at a vending machine, to promote smile at a vending machine, to promote smilehealth.
- **Smile-trainer**: A browser for social media that only works when people smile, it’s difficult to bully someone when also smiling!
In September 2017 Fabricademy program, mixing textiles, biology and digital fabrication, launched its first cycle with more than 20 students in 15 nodes. Fabricademy starts as a transdisciplinary course that focuses on the development of new technologies applied in the textile industry, in its broad range of applications, from the fashion industry to the upcoming wearable market. Like in Bio-Academy, lectures are delivered by global experts for each topic, coming from world class institutions from all over the world.

2017 will be the year zero of the Diploma Thesis program, launched by Academany to nurture the development of projects within the Fab Lab Network, and to increase the impact of Fab Labs in society. The Academany Thesis aims to offer a distributed development platform for innovators and researchers within the Fab Lab network, in collaboration with worldwide experts in different fields of knowledge and practice, who want to bring projects initiated in the different Academany programs to the next step. The Diploma Thesis is aimed to have multiple exits, it could be considered as an incubation (business), research (education) or development (social) process to increase the impact of projects from the Fab Lab community.