Open Thesis Fabrication

Iaac | Institute for advanced architecture of Catalonia

INSTITUTE FOR ADVANCED ARCHITECTURE OF CATALONIA

OPEN THESIS FABRICATION

OPEN THESIS FABRICATION
POSTGRADUATE IN 3D PRINTING
2019/2020

Directed by: **Areti Markopoulou**

1.0

OTF
POSTGRADUATE IN 3D PRINTING ARCHITECTURE

1.0

OTF
POSTGRADUATE IN
3D PRINTING ARCHITECTURE

The OTF - Open This Fabrication progrmme is a 6-month intensive applied research in the field of additive manufacturing specifically oriented to the development of sustainable architecture. Connecting the use of advanced technology in construction and the desire to develop a holistic design approach to architecture, we engage with different areas of research that include robotic manufacturing, material research and performance-based design.

3D printing is reaching the construction industry and becoming a reality for architecture. The programme seeks to develop technological and architectural solutions, in collaboration with Industry partners, to answer the current needs and challenges of our habitat.
The OTF programme aims to explore the new opportunities that this new technology permits, and to train the necessary professional for this new interdisciplinary field, between Design, Engineering, Material Science and Construction.

The programme runs as a partially collective programme with a mixed group of researchers of IAAC Master second years and other specialised students with interest in 3d printing, in eco-friendly material research or in the field of housing.

The course is structured in 3 phases: the first phase is oriented to developing explorations, specifically a series of exercises to gain knowledge into the topic; this is then followed by a design charrette, where the design explorations for the specific technology are explored and defined; and finally the construction phase dedicated to the development of a 1:1 prototype that aims to be as close a possible to a real building fragment.

Applied Research

While the programme is axed around the use of the novative technology of 3d printing together with the use of eco-friendly material such as clay, a combination that is still barely present in the construction industry, the programme's objective is to provide solutions for today.

The OTF has started a collaborations with Non-Governmental-Organisations with whom we are developing solutions for existing humanitarian scenarios in various African countries. Our students are in direct contact with officers that assess them in the establishment of project strategie

Learning Objectives

Each participants will get intensive experience in large scale 3d printing and gain the necessary knowledge that accompanies it:

- Digital Fabrication : Robotic Fabrication, 3D printers, Extrusion technologies, Sensors
- Digital tools: 3D modelling, parametric modelling, digital simulation, production of g-code.
- Material research: empirical and scientific methodology in development and testing of new materials.

- Design methodology to provide architectural and constructive solutions for additive manufacturing. by relating design to performance.
- holistic strategy to provide architectural solutions that consider all aspects of construction: material, energy, economy, manufacturing, policies, users, design, climate, structure.

Student Profile

The Open Thesis Fabrication is aimed at architects, engineers, designers, material engineers, mechanical engineers, or professionals from related fields with a previous knowledge in computational design, digital fabrication and sustainable construction, willing to learn and explore the new possibilities offered by additive manufacturing in architecture.
This programme offers the possibility to apply knowledge and skills previously learned in a real design and fabrication project. Students are required to have previous knowledge in computational design and digital fabrication. We recommend to have previously completed a Master in Advanced Architecture or Equivalent

The course aims to specialise these people to address a new reality in construction, architecture, and the fields that relate to it, in which new technologies will largely affect the way we think and build.
After completing the OTF programme, the students will be apt to work within the fields of architecture and engineering providing expertise and knowledge in topics such as robotic construction, additive manufacturing, parametric design. They are also encourage and apt to further their career within the realm of non-governmental organisations that develop housing projects in problematic humanitarian situations.

Once successfully finished, IAAC students will then join the IAAC Alumni Community, an active and dynamic network of visionary professionals spread around the world, promoting principles and applications of Advanced Architecture and exploring new academic and research initiatives, leading to award-winning practices or working for internationally renowned firms and institutions.

1.1

OTF - POSTGRADUATE IN 3D PRINTING ARCHITECTURE
Programme Structure

Credits: 45 ECTS

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6 months programme // September 2019 to February 2020 – Full Time
Language: English

The OTF programme is structured into 3 research fields and in 3 phases.

RESEARCH FIELDS
STUDIO - Design and Architecture
TECHNE - Robotic and Comptational Technology
MATTER - Matter and Craft

PHASES
Exploration
Prototype Design Charrette
Prototype Construction

PHASES
Phase 1 - Exploration
This 3 months long phase emphasises on the development of knowledge in the 3 above mentioned research areas: material, 3d printing and design methodology. This phase sees the students work in small groups in short intense exercises and experiments.

Phase 2 - Prototype Design Charrette
The second phase is a collective design charette in which the group capitalises on all the learning of phase 1 in order to develop a design proposal for a 1:1 prototype as a building fragment.

Phase 3 - Prototype Construction
The third phase sees the group engage with the construction of a large prototype at 1:1 Scale. In parallel, the group will document and compile the research into a collective thesis printed document.
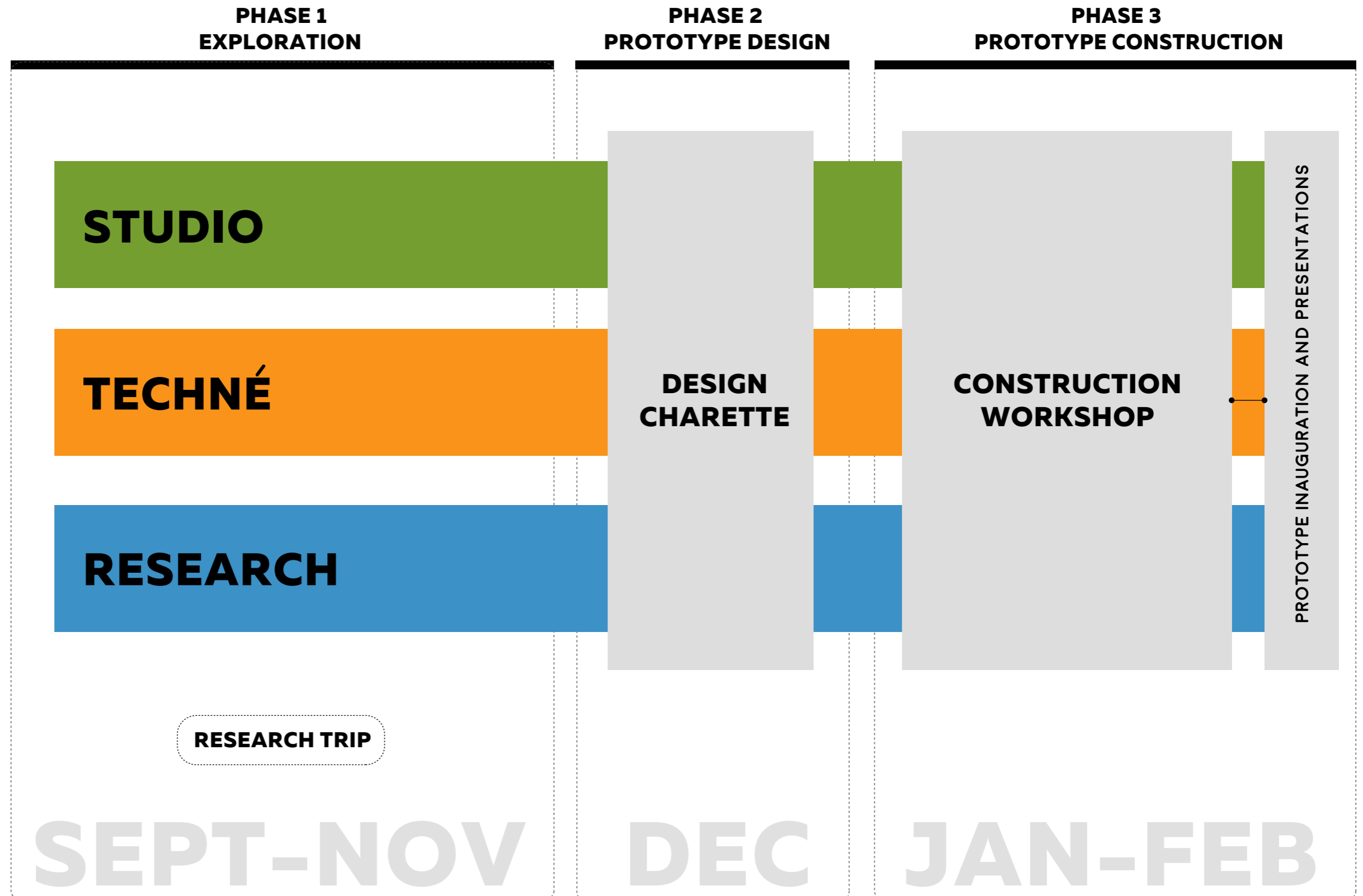
OTF - POSTGRADUATE IN 3D PRINTING ARCHITECTURE

Programme Structure

Credits: 45 ECTS

INSTITUTE FOR ADVANCED ARCHITECTURE OF CATALONIA

OPEN THESIS FABRICATION

PHASE 1
EXPLORATION

PHASE 2
PROTOTYPE DESIGN

PHASE 3
PROTOTYPE CONSTRUCTION

STUDIO

TECHNÉ

RESEARCH

DESIGN CHARETTE

CONSTRUCTION WORKSHOP

PROTOTYPE INAUGURATION AND PRESENTATIONS

RESEARCH TRIP

SEPT-NOV **DEC** **JAN-FEB**

The following programme refers to the Academic Year 2018-2019.

2.0
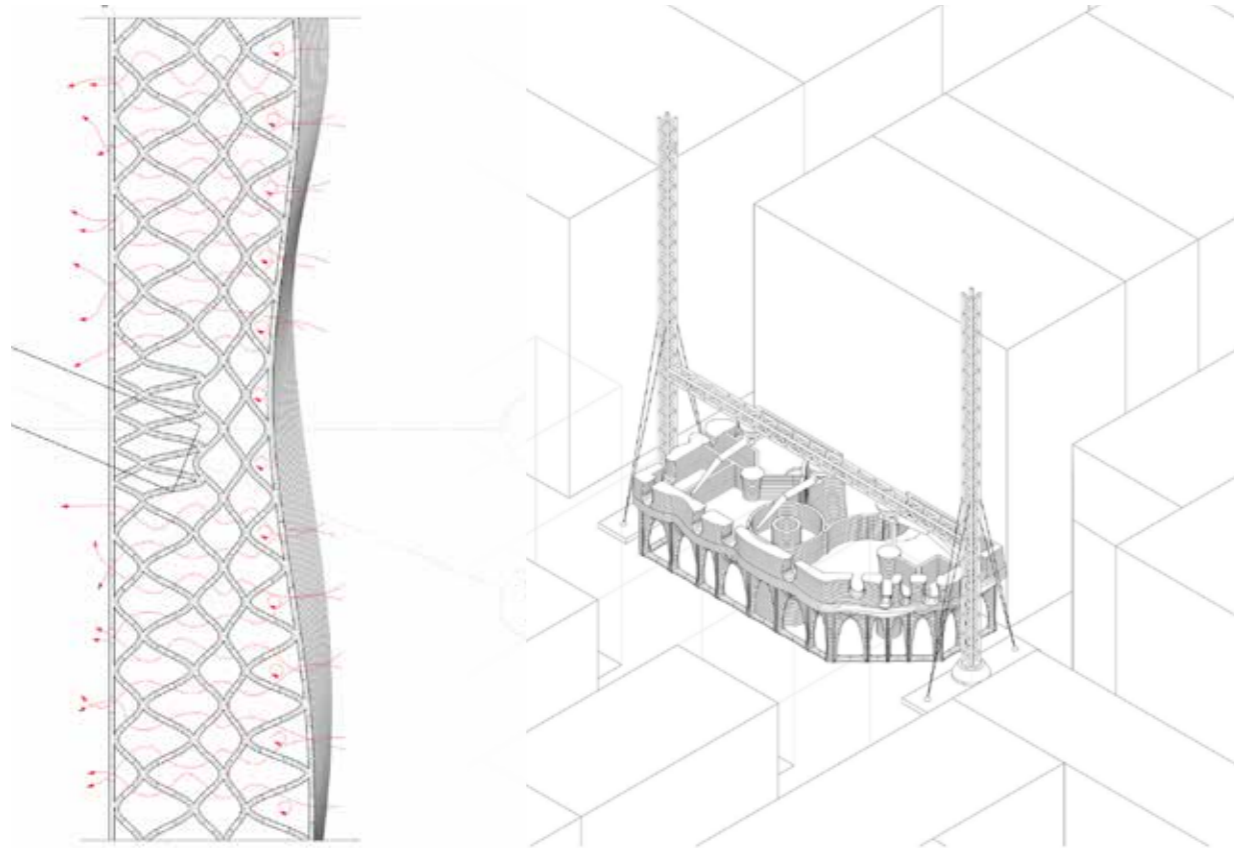
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POSTGRADUATE IN 3D PRINTING ARCHITECTURE
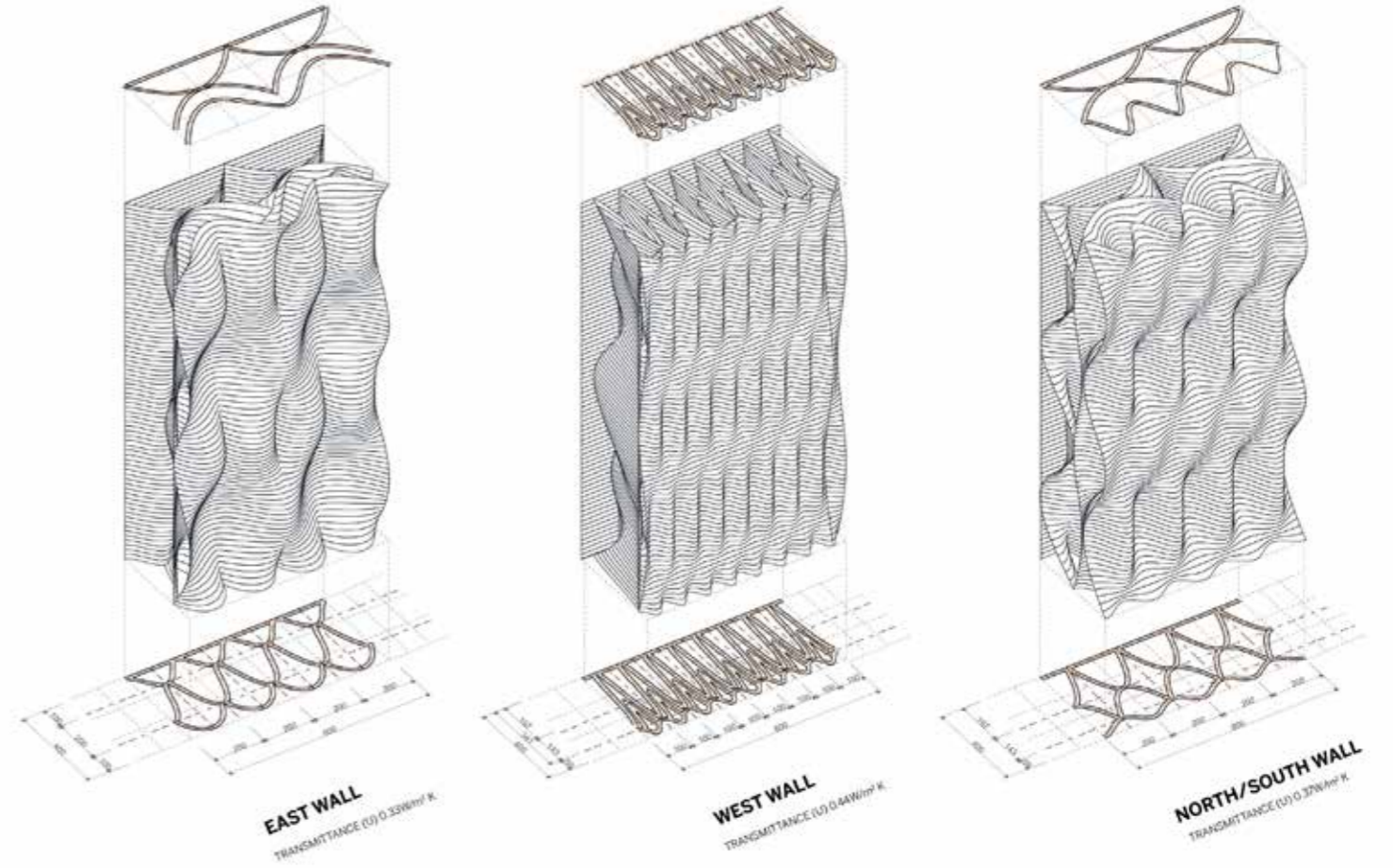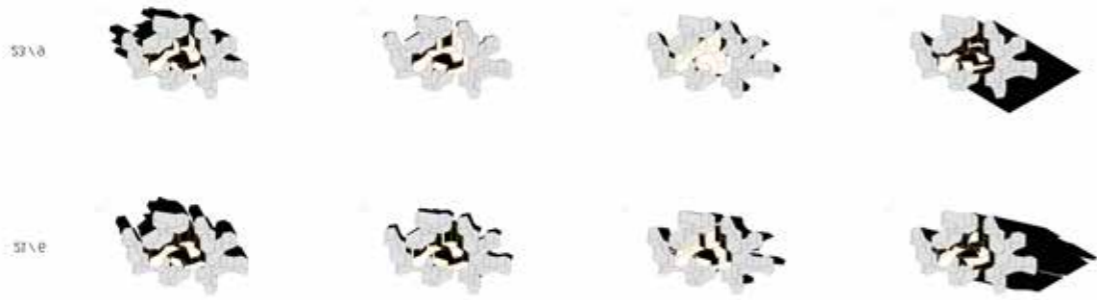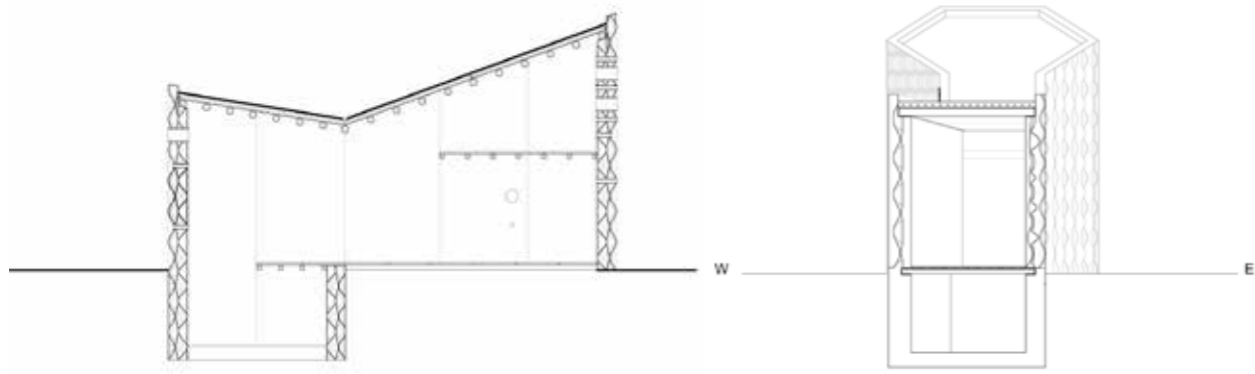RESEARCH FIELDS

2.1

STUDIO

Design and Architecture

Faculty:
Edouard Cabay

3D printing, a digital technology, challenges conventional design approaches calling for the elaboration of new strategies, partially based on the use of computation.
The Studio focuses on developing a performance-based approach towards design for 3D printed architectural solutions. In the context of a design project for a site-specific humanitarian situation, the design of buildings is the result of a complex negotiations between fulfilling climatic, structural, manufacturing and habitation purposes.


BARCELONETA
VAN LIMBURG , G. REFALIAN, F. SEVOSTIANOV

EAST WALL

TRANSMITTANCE (U) 0.33W/m² K

WEST WALL

TRANSMITTANCE (U) 0.44W/m² K

NORTH/SOUTH WALL

TRANSMITTANCE (U) 0.37W/m² K

WALL CATALOGUE

2.2

TECHNE

Robotic and Computational Technology

Faculty:
Alexandre Dubor

Techne offers a experimental and hands-on approach to Additive Manufacturing with robots. Eco-friendly material printing resides in the control of robotic technology and the mastering of it's complex materiality. Through a series of intensive workshops specific questions related to structure or climatic performance are addressed through rapid back and forth between 3d modelling, printing and analysis of the solutions.

West   North   East   South

South_East   North-West
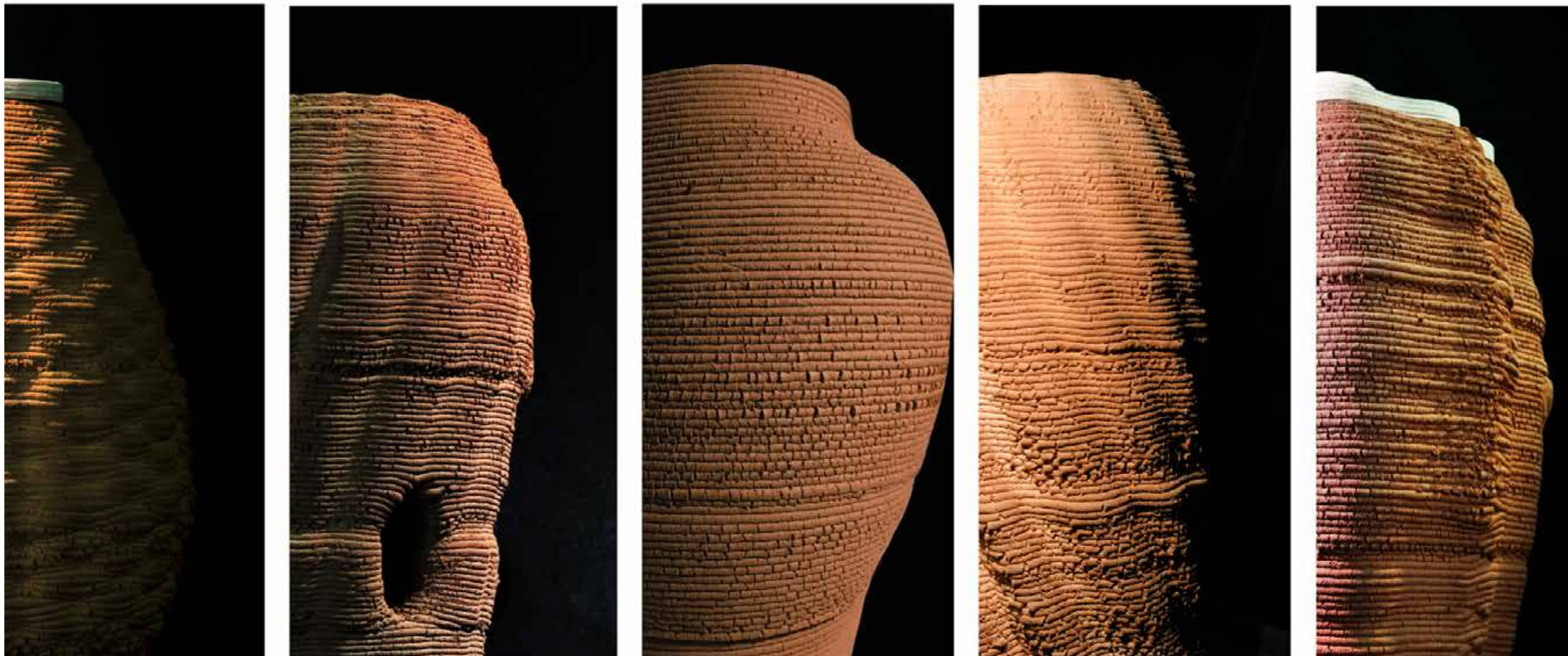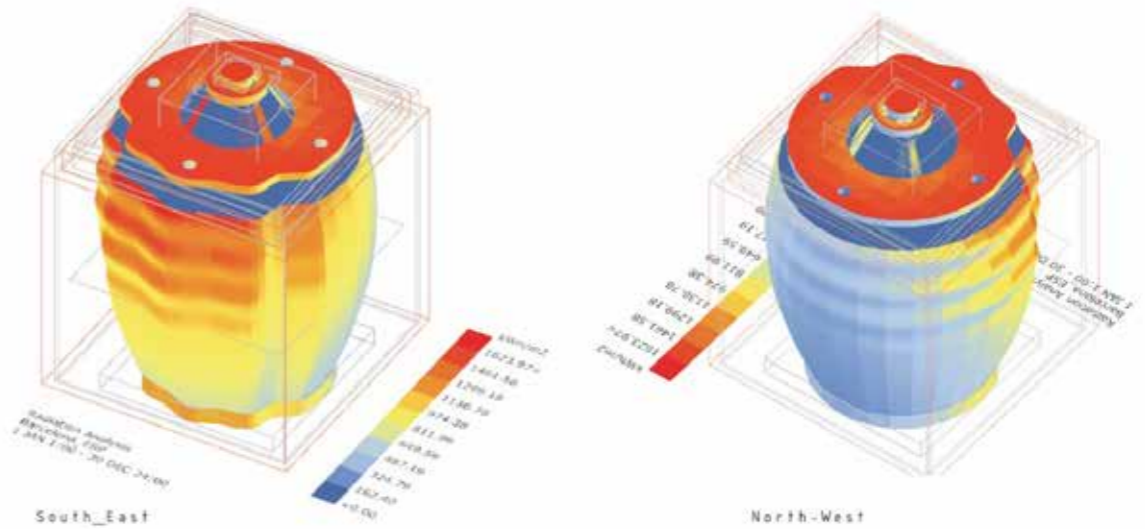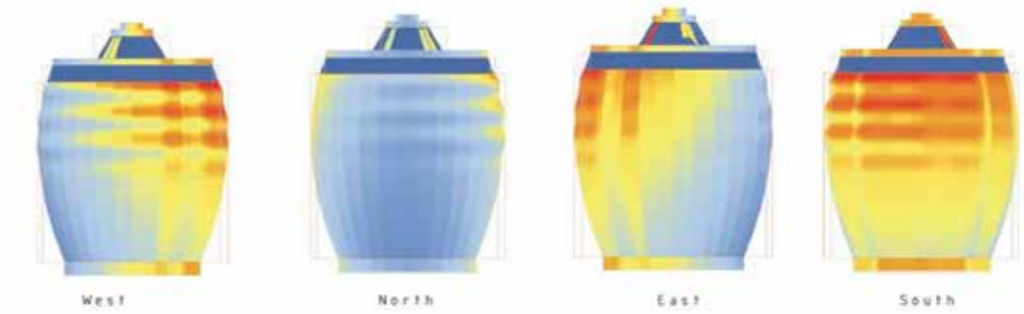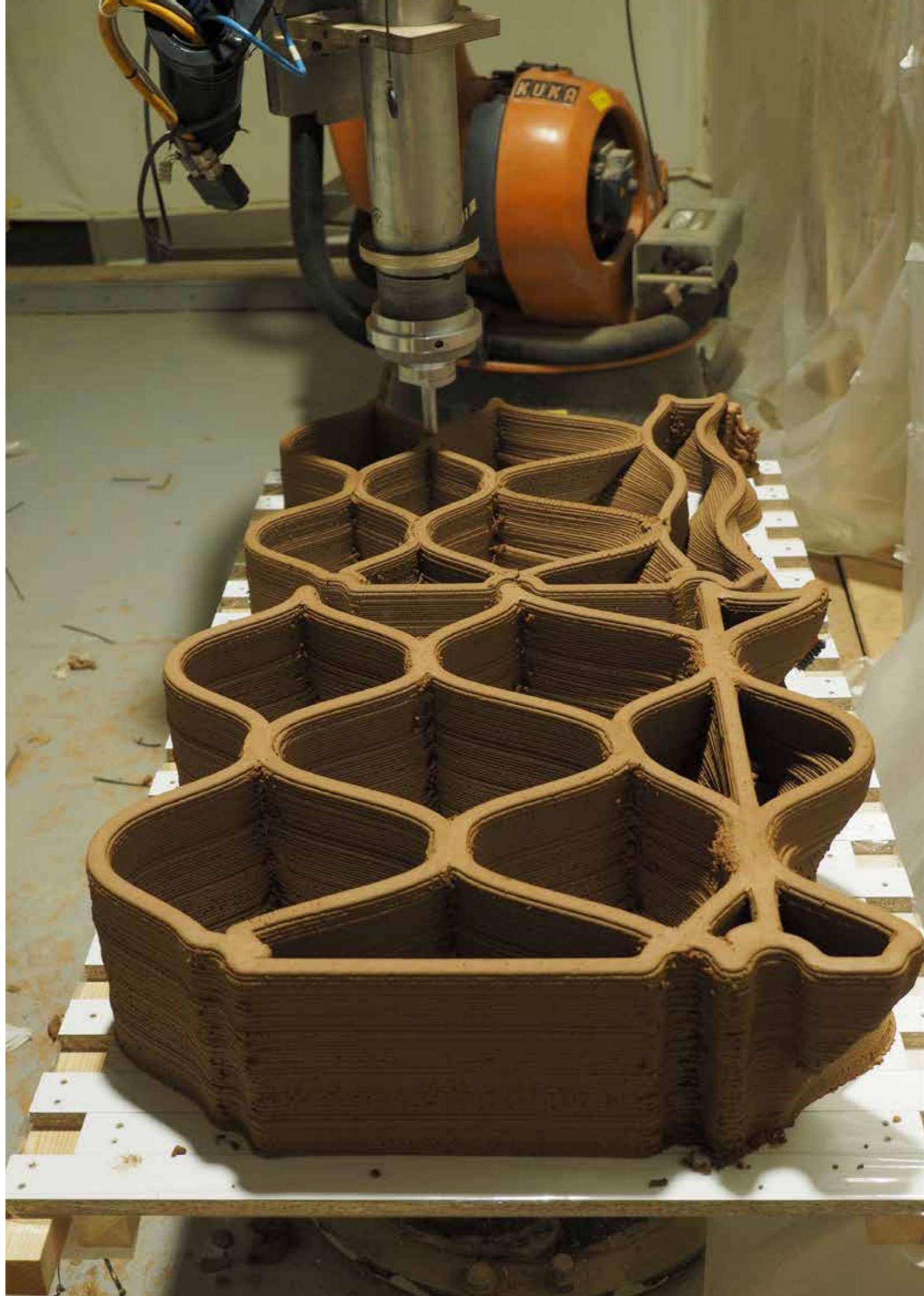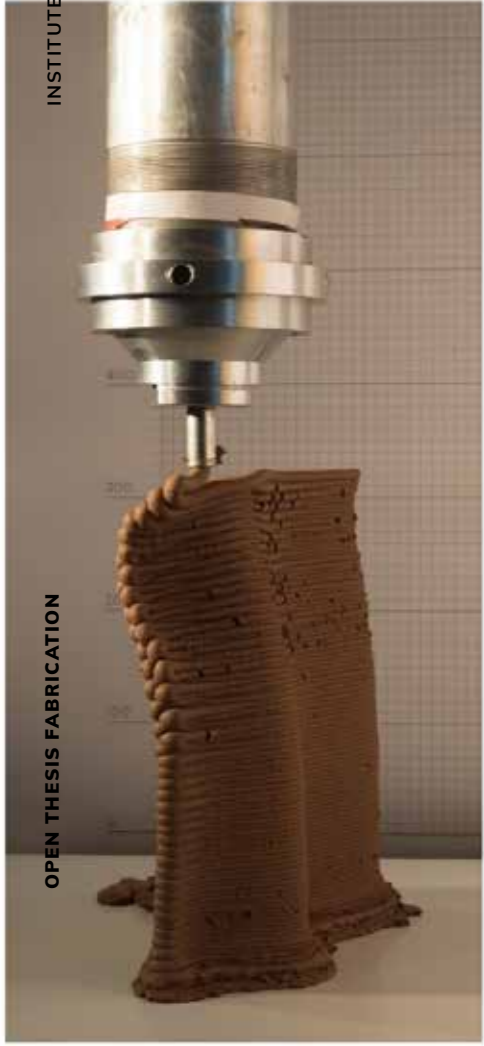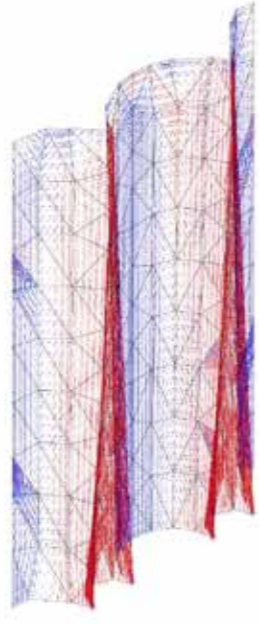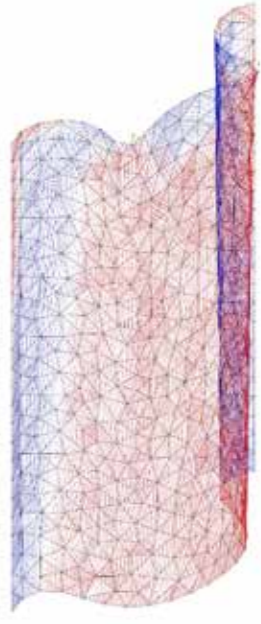
2.3

MATTER

Matter and Craft

Faculty:
Joaquim Melchor

**An intuitive and scientific approach to material research:
this is the occasion to develop knowledge in the field
of eco-friendly materials such as clay, a material that
has been used in construction for millennials and of
which a lot of knowledge has been lost since the over-
dominance of concrete in the construction industry.**

**Driven by material experts, this phase of the work starts by a
tactil and intuitive to material mixing, and concludes by the
elaboration calibrated and customised material mix for 3d
printing**

ENZYME   CASEIN   FISH GLUE   RABBIT GLUE   WHITE RICE   WHEAT   CORN   ALGINE

COLLAGENS   STARCH

HARDNESS
CRACKING
DENSITY
DRYING TIME
SHRINKAGE
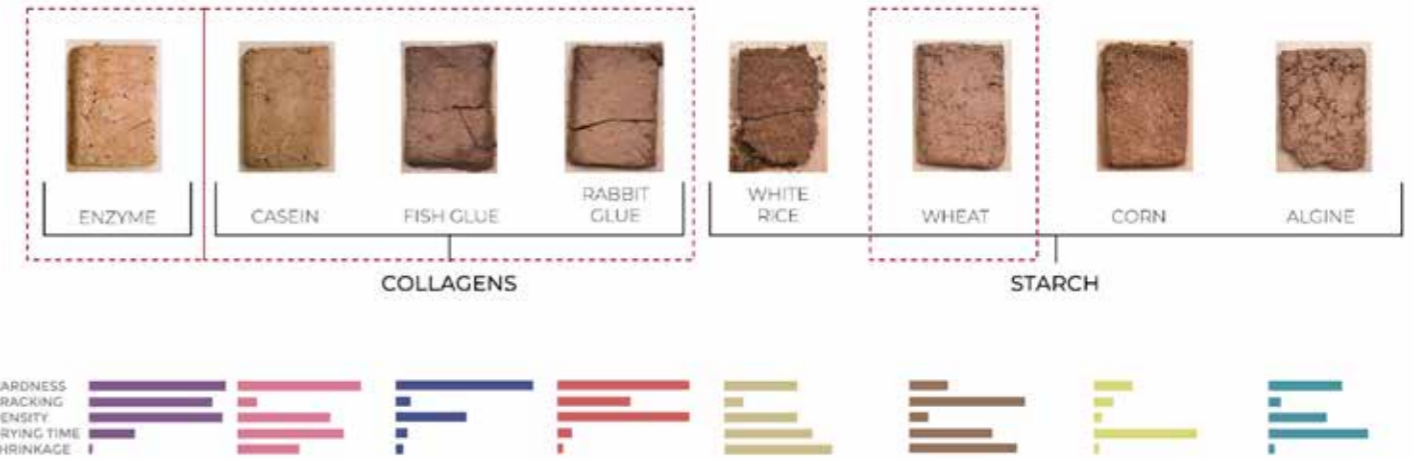
3.0

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POSTGRADUATE IN 3D
PRINTING ARCHITECTURE

PREVIOUS EDITIONS

3.1

2017-2018
DIGITAL ADOBE

The final prototype of the 2017-2018 OTF program is a 2-metre wide and 5-metre high printed clay wall with a varying thickness (0.7m at its bottom and 0.2m at its top) facing the south. At a height of 2.6m, a wooden slab rests on the wall, as to simulate a clay/wood building unit, where the connections between two materials and the vertical load from horizontal slab can be tested. It is a self-standing structure in which the thickness of the wall and the geometry of its 6 layers are designed to match the structural necessities. The wall is designed according to the local climate, taking into consideration the solar incidence, the yearly temperatures and the humidity. Two aspects, climatic and structural performances, are

again the main focuses of the this 1:1 prototype. With the long established understanding of clay's thermal properties to moderate heat transmission, the team has sought for a design to even enhance such properties. A ventilated wall design enabled through operable top/bottom openings is then created to either reduce heat gain in summer time through convection between top and bottom openings, or to retain heat in the winter as both openings are closed.

Its external geometry consists of surface of bumps of which the calibrated geometry creates a self shading pattern, optimising cooling in summer and heat absorption in winter, taking into consideration of the solar radiation angles of the locale, which in this case is Barcelona. The other crucial aspect being factored into the bump design is the printability, where the design is confined to cantilevered angles of less than 30 degrees as a result of its materiality and printing technology currently available. These climatic objectives are then incorporated on the prototype in the way where the west-ward would have have higher heat gain, while the east-ward would have lower heat gain at a given time. That is, a greater amount of thermal mass and less ventilation on the west-ward wall, and a lesser amount of thermal mass and more ventilation on the east-ward, through which a comparison of performances driven by variations on design parameters can be made and observed with the help of embedded temperature and humidity sensors.
The prototype is designed to be self-standing, and thus both the wall's self weight and the load capacity of the wooden slab are taken into account for the

design of the global geometry with regard to the thickness of the wall as well as the connection of where the wooden beams meet the wall.
The geometry of the connection unit where the beams rest on the wall comes in a protruding platform at the height of 2.6m, which gradually receding into the wall as it reaches the bottom. This allows for a more distributed vertical load to go onto the contact brick and thus an increased level of the wall stiffness to hold the beams in place.

Project Credits
Faculty: Alexandre Dubor, Edouard Cabay, Mathilde Marengo, Kunaljit Chadha, Sebastian Moreno.

Students: Ya-Chieh Chang, Daniele Fiore, Filipp Sevostianov, Gelder van Limburg Stirum, Quan li,Sheikh Rizvi Riaz, Dongliang Ye.

Collaborators : Windmill, La Salle, Nanosystems, ArtCon and SmartCitizen
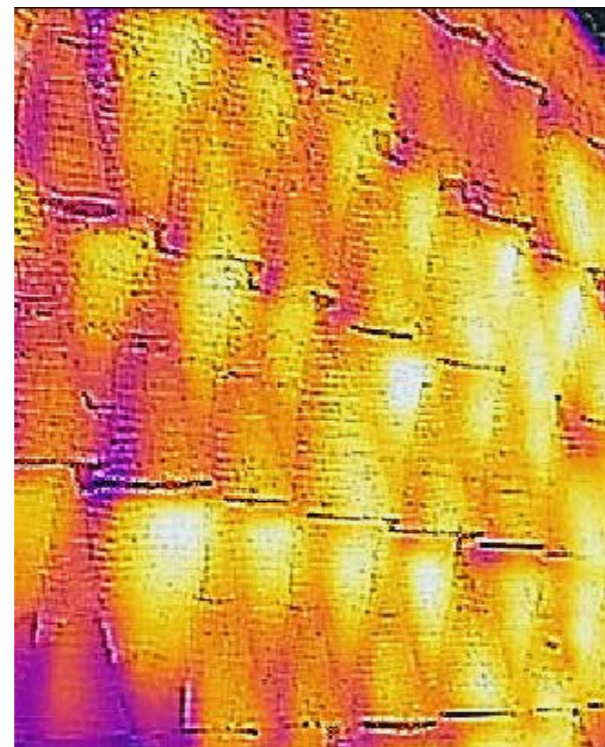
3.2

2016-2017
TERRAPERFORMA

The final prototype of the 2016-2017 OTF program was realized with a modular approach

The modules are parametrically conceived so that they have optimum performance depending on solar radiation, wind behavior and structural 3D printing reasoning, both by their own and as a whole design. The façade was conceived as a gradient in both horizontal and vertical directions, having various radiuses of self-shading, in order to optimize east and west sun.

Additionally, the modules are designed to incorporate various types of openings, in order to maximize the natural daylight potential – the openings are strategically placed and vary from micro openings to full openings between bricks are light channels. The same channels are also designed to aid wind behavior through convection properties, as well as the placement of the microperforation which would direct air flow.

Project credits
Program Directors: Edouard Cabay, Alexandre Dubor,

Research Advisors: Areti Markopoulou, Angelos Chronis, Sofoklis Giannakopoulos, Manja Van De Warp, Mathilde Marengo, Grégoire Durrens, Djordje Stanojevic, Rodrigo Aguirre, Kunaljit Singh Chadha, Ji Won Jun, Ángel Muñoz, Wilfredo Carazas Aedo, Josep Perelló, Pierre-Elie Herve, Jean-Baptiste Izard, Jonathan Minchin.

Researchers: Sameera Chukkappali, Iason Giraud, Abdullah Ibrahim, Raaghav Chentur Naagendran, Lidia Ratoi, Lili Tayefi ,Tanuj Thomas
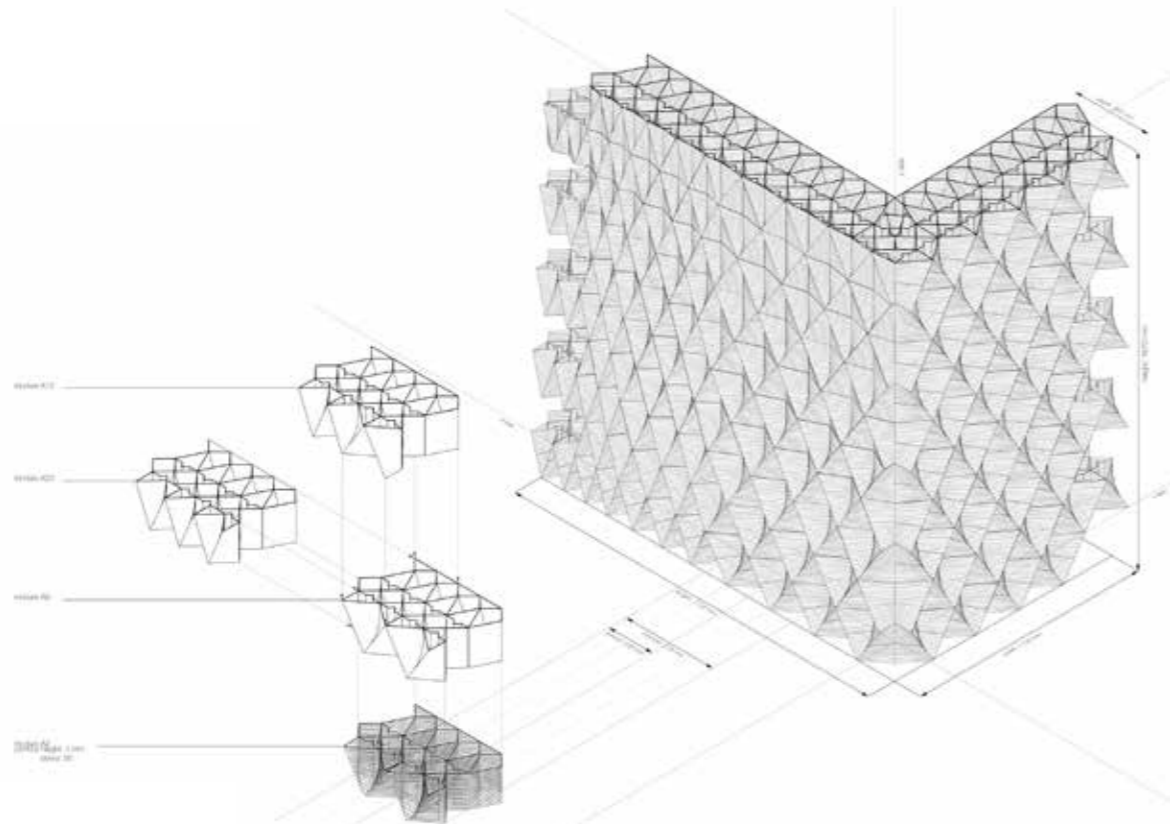
3.3

2015-2016
DIGITAL URBAN ORCHARD

The 2015-2016 edition of OTF focused on the design and fabrication of a wooden pavilion with digital and robotic fabrication means, based on the functional program of an urban orchard.

The pavilion is the prototype of a new form of urban agriculture based on aquaponics: a symbiotic system where breeding fishes is combined with the soilless cultivation of plants and vegetables.
The design of the pavilion has been optimized in order to maximize the solar exposition of the plants, both on the surface and on the interior of the pavilion.

The form has been developed following wind and solar analysis. The design of the wooden structure allows the mounting of the aquaponic systems allowing the flow of water along the flow of lines in the structure. The facets of the wooden structure are designed to capture the ideal solar radiation suited for winters and also summers. Play of shadows through the wooden structure avoids the excess radiation onto the plants during summers. Scattered wooden members on the top of the pavilion allow solar radiation to evenly reach the plants grown on the pavilion.

The pavilion is divided into three major components: aquaponic system, silicon skin and wooden structure. Each perform a primary function and form the frame work for the other component to function.direct air flow.

Robotically Fabricated Wooden Structure
The realization of the Digital Urban Orchard involved computational methods and robotic fabrication tools. Hence the implementation of a 1:1 scale prototype allowing to test techniques and materials on real scale. The resulting form was manageable to fabricate, realized using sticks of Redwood of Flanders (45×45 mm). The Pavilion's design combines solar/wind shape optimization, structural logics, the robotic his cocoon-shape hidden in between a misleading undifferentiated amount of wooden slats manifold structural purposes and functional ones. The sticks are distinguished in main trusses, structural stiffeners, plants supports, skin holders, furniture supports and platform beams. fabrication constraints together with the in-situ manual assembly. This last step splits the structure in 12 different bow-shaped sections: they are pulled together and manually screwed in position.

Silicon Membrane
During the following phases of the construction, the pavilion will be complemented by a transparent protective skin self responding to the internal and external environmental conditions and the integration of the farming products with plants and fishes. This membrane on top of the wooden structure controls the ventilation air inside the pavilion. Sensors with the help of arduino control the temperature and humidity by initiating the active inflation and deflation mechanism in the skin to maintain optimum temperature needed for the growth of the plants on the pavilion.

Aquaponic System
A simple network of pipes mounted on the wooden structure allows the plants to grow. Water from the aquaculture system in the fish tank is fed to the hydroponic system mounted on the structure, where the by-products are broken down by nitrification bacteria into nitrates and nitrites, which are utilized by the plants as nutrients, and the water is then recirculated back to the aquaculture system in the fish tank.

Credits:
Faculty: Areti Markopoulou, Silvia Brandi, Alexandre Dubor, Djordje Stanojevic.
Students: Josep Alcover, Angelo Figliola, Yanna Haddad, Ji Won Jun, Monish Kumar, Mohamad Mahdi Najafi, Andrea Quartara, Fathimah Sujna Shakir.

Velocity (m/s) [Pressure (Pa)]
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5.218 [2.892]
4.261 [-3.605]
3.013 [-10.102]
0 [-16.599]
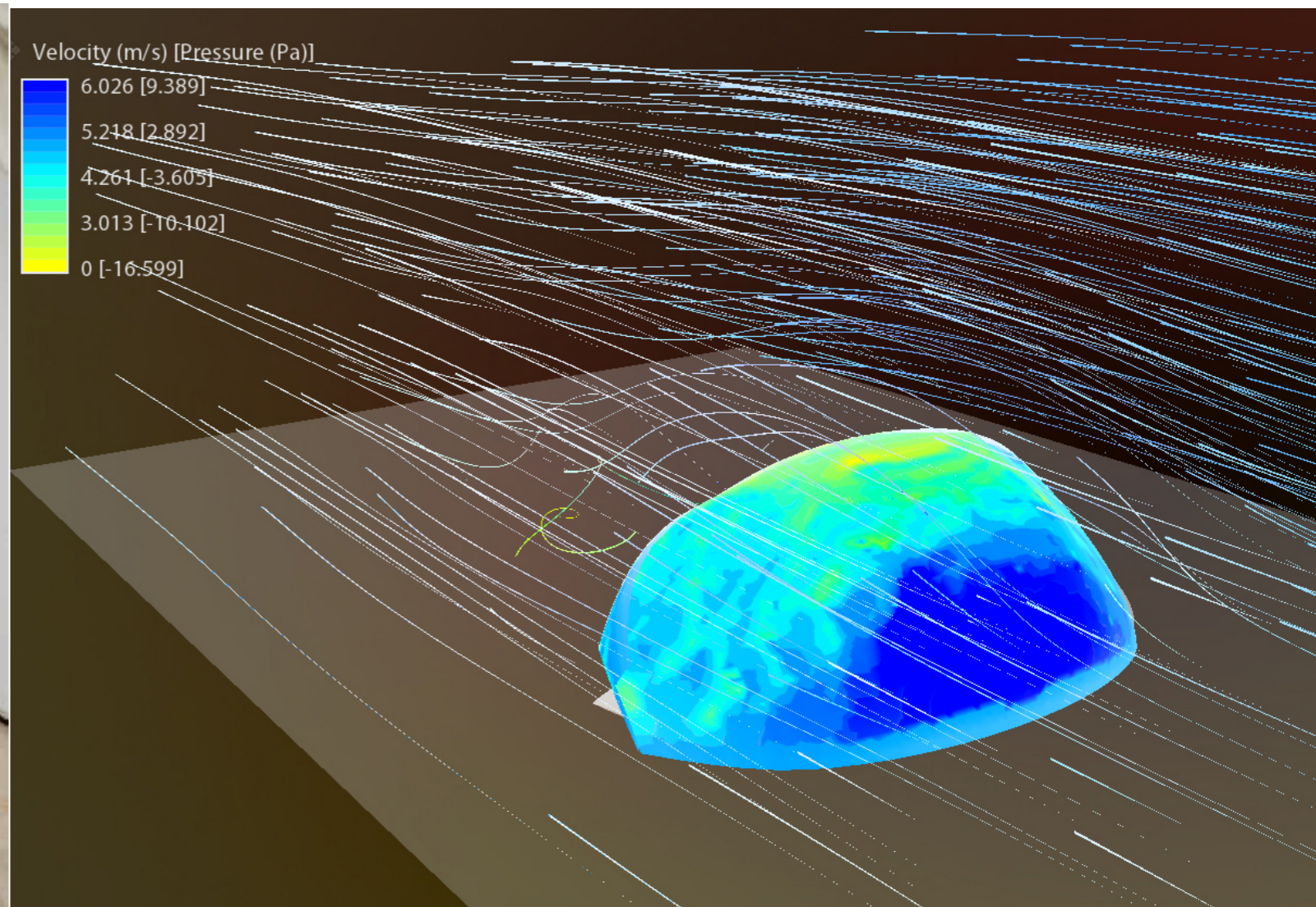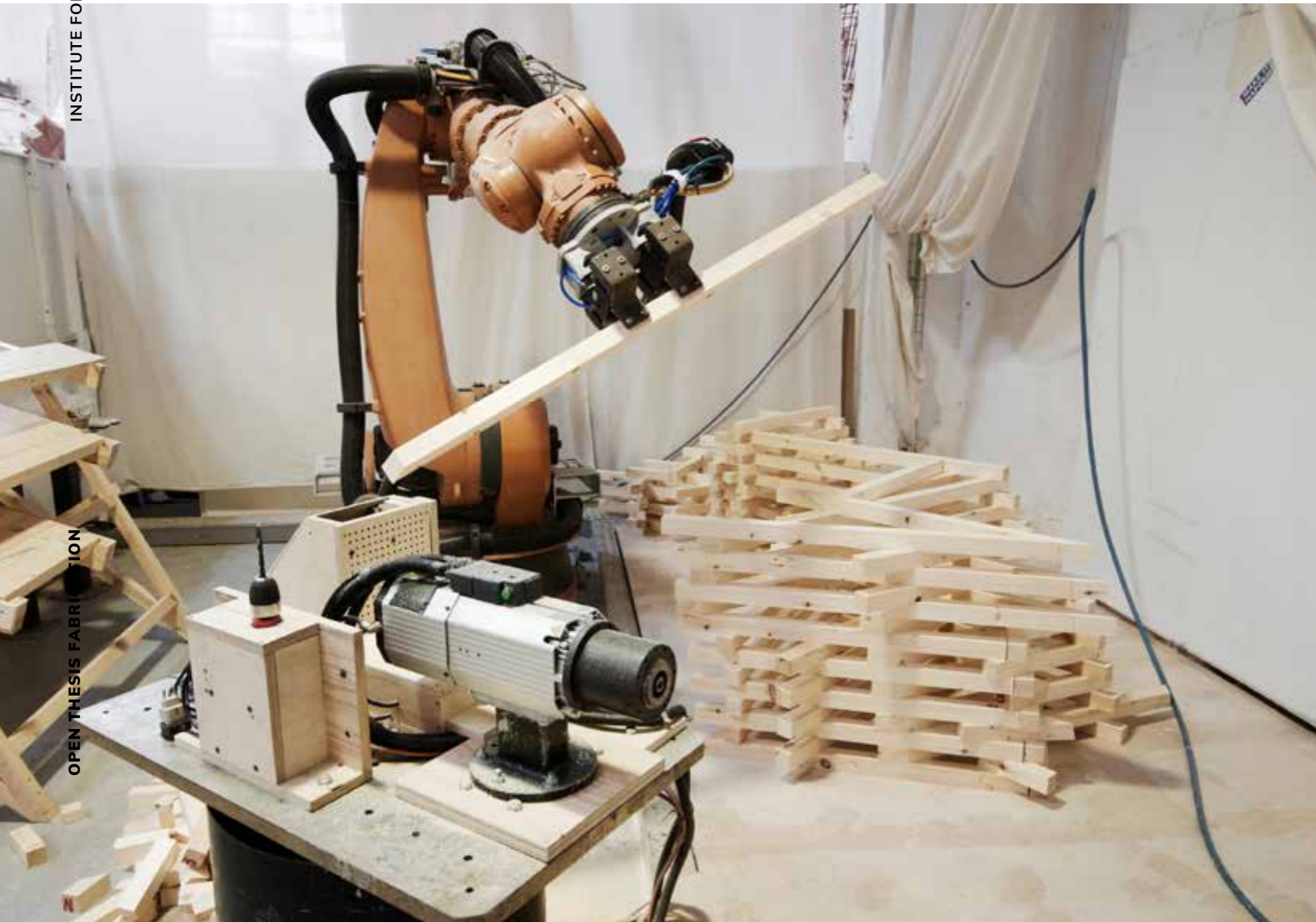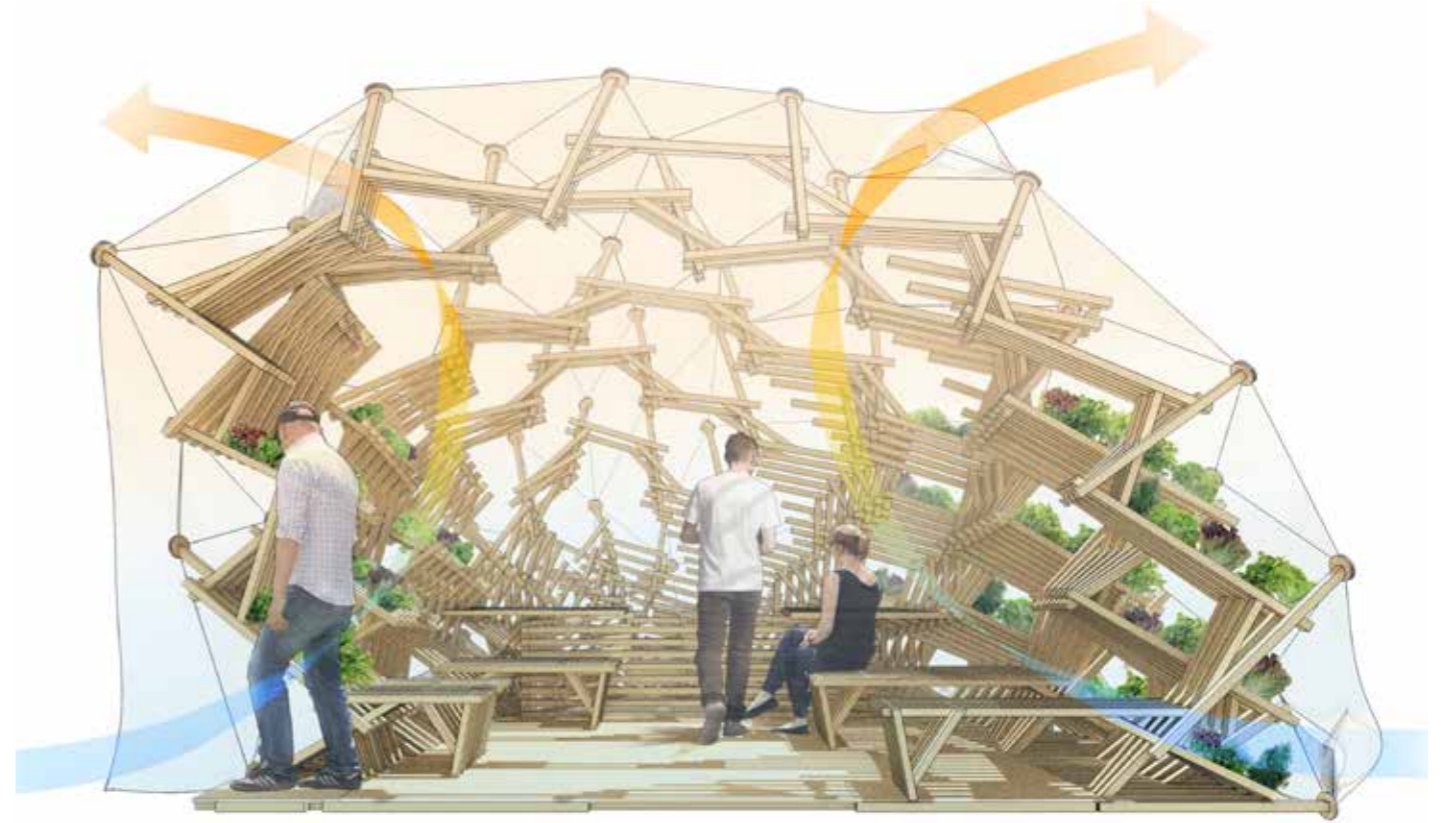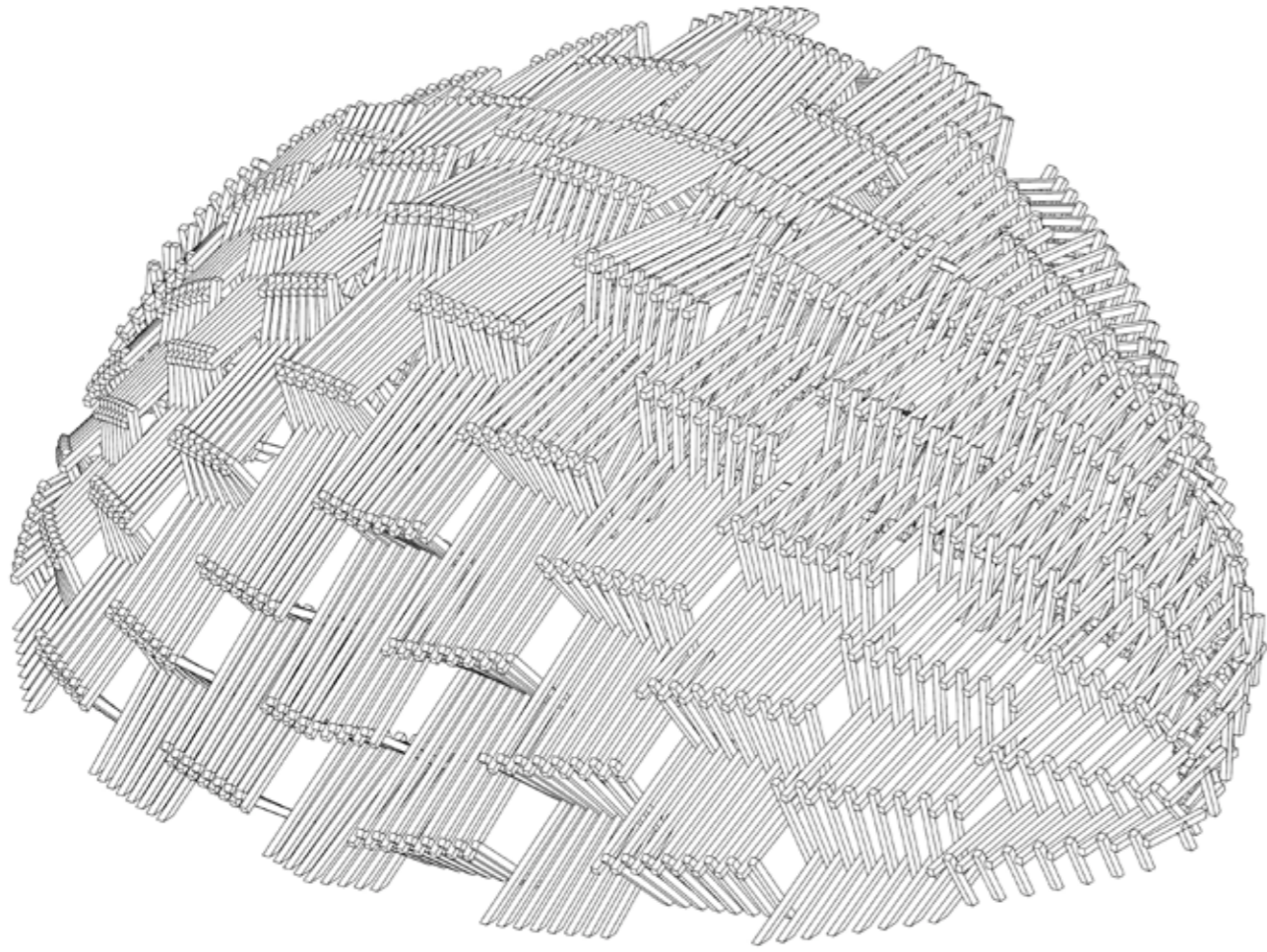
3.4

MINIBUILDERS

Small Robots printing Big structures

obotics offer great potential towards innovation within the construction industry. However, in their current implementation applied to the architectural field, in particular, construction robotics, these systems all share a specific limitation: the objects they produce are linked to and constrained proportionally to the size of the machine. This methodology of production and construction is not scalable. In this sense, to create a house, using current construction robotics, the machine needed must have a work envelope as large as the house itself.

The project aims to address this particular limitation through the creation of a technology that is both scalable and capable of fabricating structures using tools that are independent of the final products shape of size.

The objective was to develop a family of small-scale construction robots, all mobile and capable of constructing objects far larger than the robot itself. Moreover, each of the robots developed was to perform a diverse task, linked to the different phases of construction, finally working together as a family towards the implementation of a single structural outcome. Hence, instead of the implementation of one large machine, a number of much smaller robots were generated, working independently, but in coordination, towards a single goal.

Specifically, a family of three robots was developed, each robot linked to sensors and a local positioning system. These feed live data into a custom software which allows us to control the robots' movement and deposition of the material output: fast setting artificial marble.

The first robot, the Base Robot, lays down the first ten layers of material to create a foundation footprint. Sensors are mounted inside the robot control the direction, following a predefined path. Travelling in a circular path allows for a vertical actuator incrementally adjust the nozzle height for a smooth, continuous, spiralling layer. The advantage of laying material in a continuous spiral is that it allows for constant material flow, without having to move the nozzle up at intervals of one layer.

To create the main shell of the final structure of the second robot, the Grip Robot, attaches to the foundation footprint. Its four rollers clamp onto the upper edge of the structure allowing it to move along the previously printed material, depositing more layers. The nozzle moves dynamically allowing for greater accuracy of the material output, to create a curved surface the material output will be incrementally offset. Heaters, integrated into the robot's structure increase the local air temperature to influence the curing process. Controlled by custom software, the robot follows a predefined path, but can also adjust its path to correct errors in the printing process. Rotational actuators control height above the previous layer to maintain a consistent layer.

Another major limitation of today's additive manufacturing techniques is linked to the unidirectionality of layer orientation, creating an inherent weakness. Additive manufacturing allows for heterogeneous optimised distribution of matter. To take advantage of this, and not succumb to this limitation, we used structural optimisation tools to create a second layer of material over the shell. The material is also closely aligned with the direction of stress, finally optimising both orientation and thickness of the shell structure.

The data derived from the structural analysis is then translated into paths for the third and final robot, the Vacuum Robot. Using a vacuum generator this robot attaches to the surface of the previously printed structure. Moving freely over the first shell on its tracks, depositing material on the surface of the shell, enhancing its structural properties. This task can be performed by one robot or a swarm of robots working in coordination.

Project Credits

Faculty: Saša Jokić, Petr Novikov.

Students: Shihui Jin, Stuart Maggs, Dori Sadan, Cristina Nan.

Sponsor: SD Ventures,
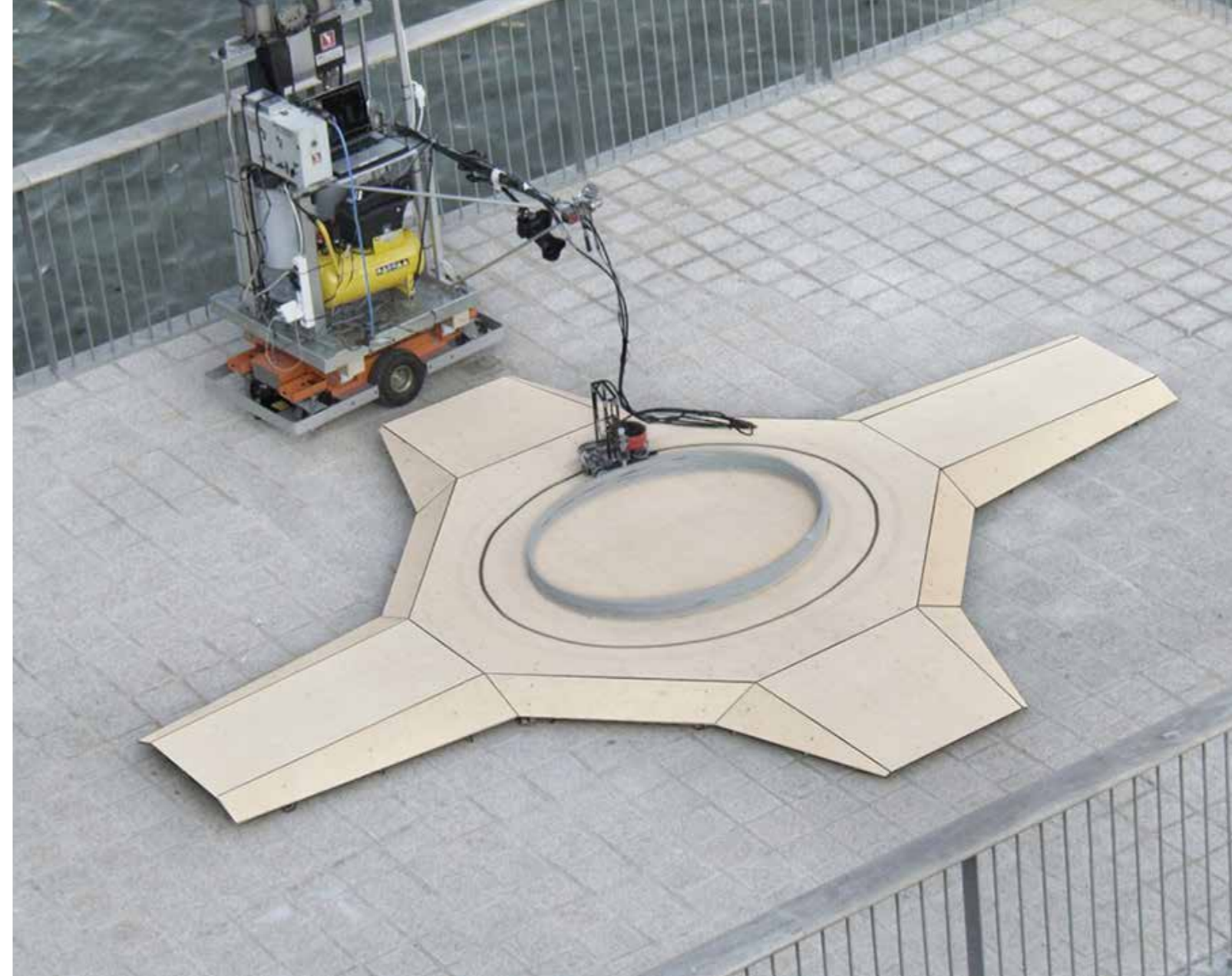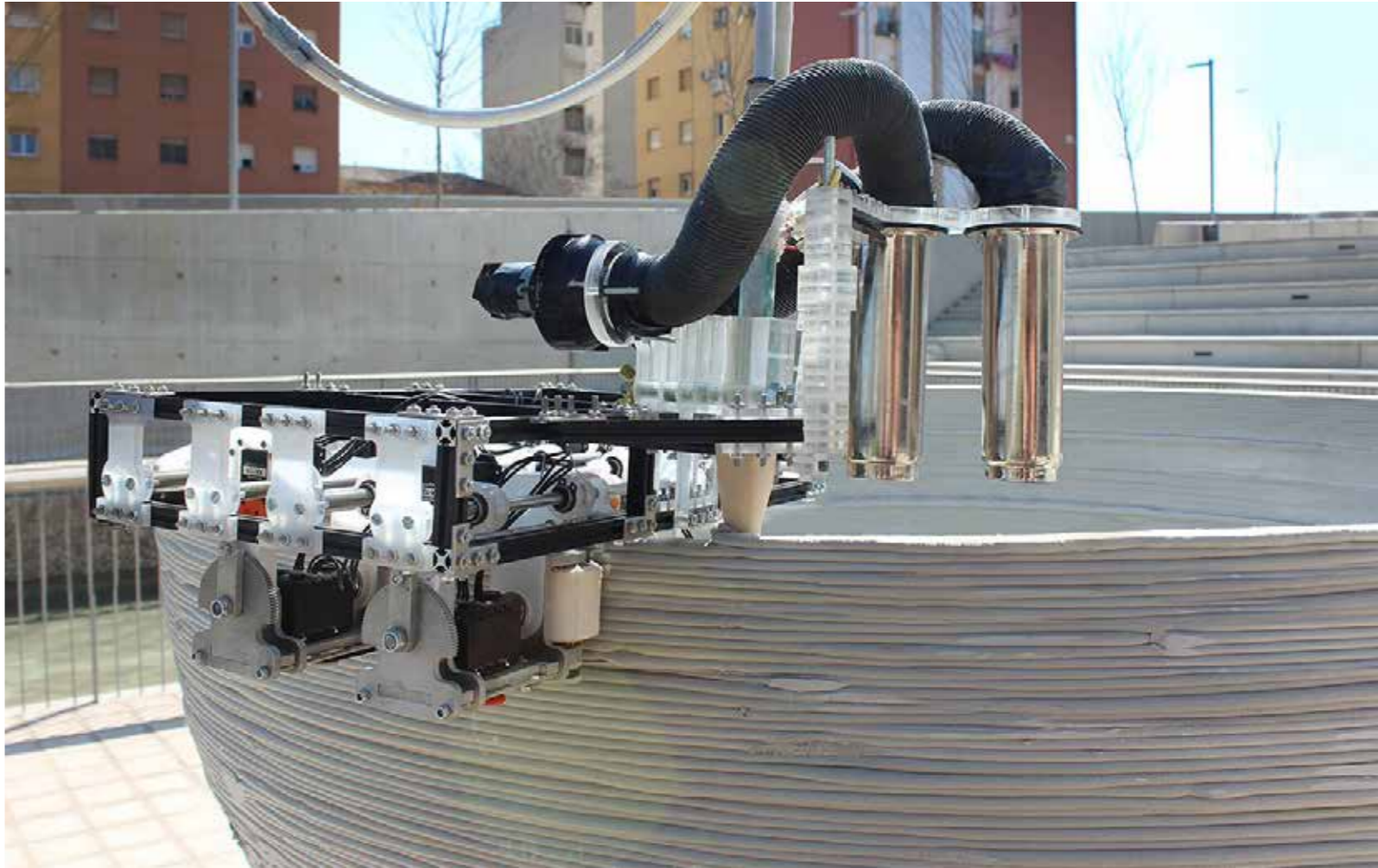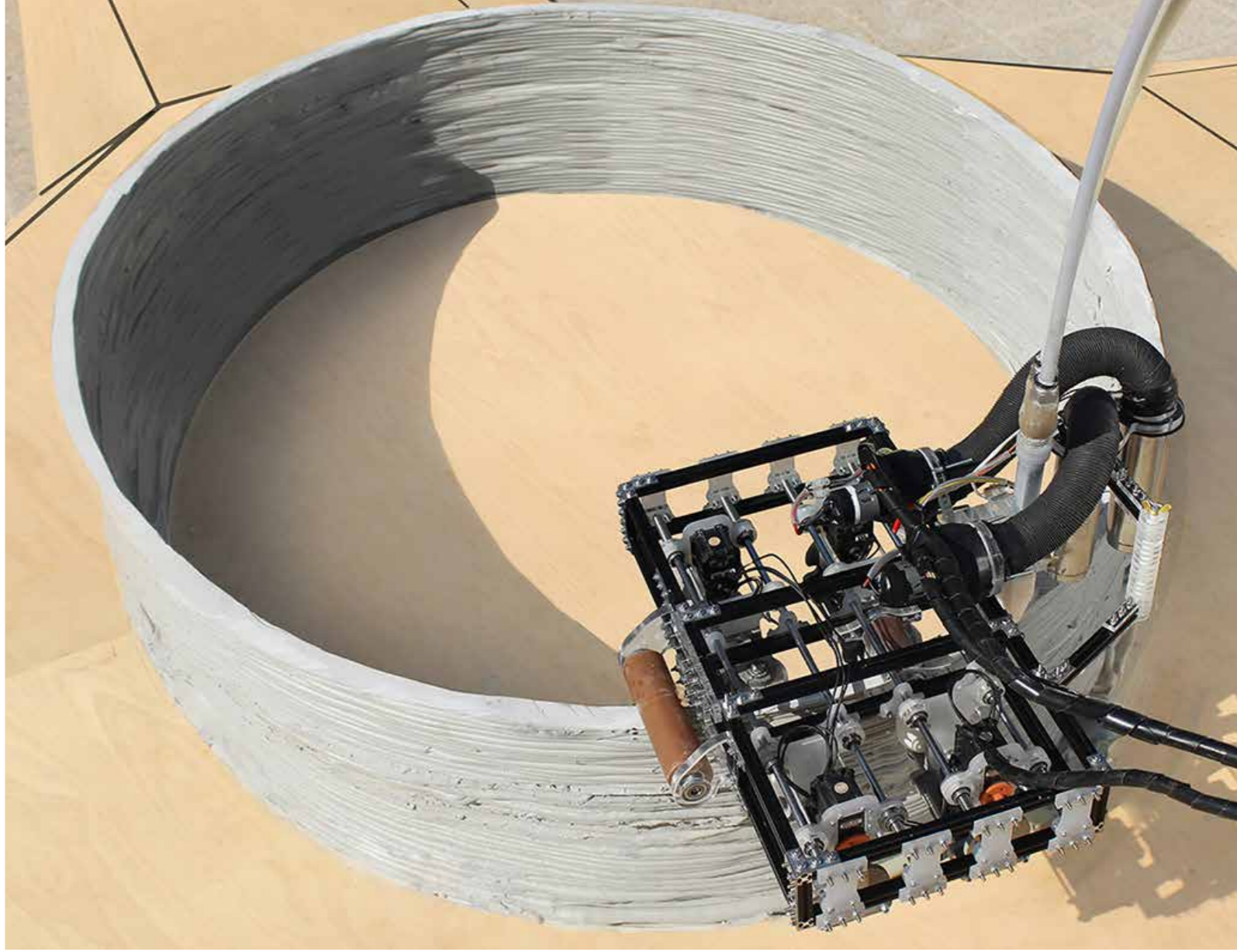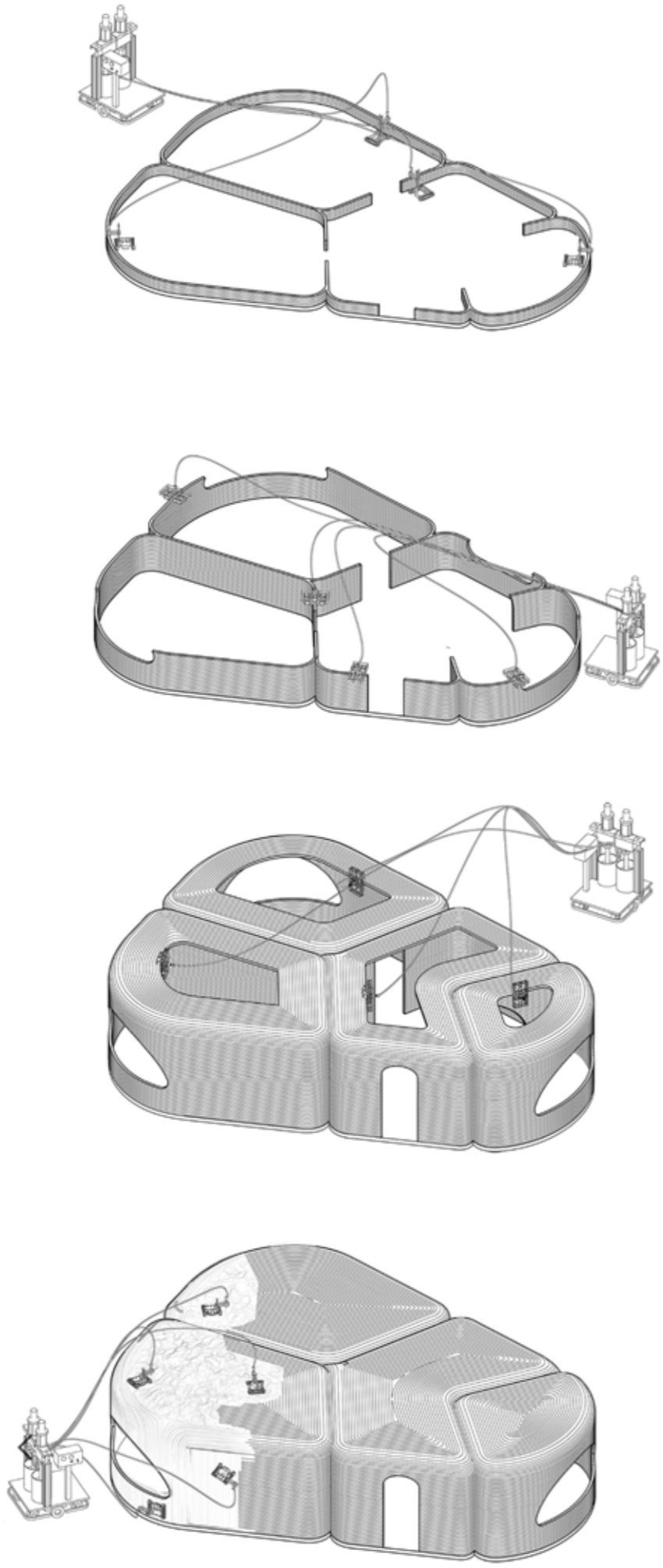
4.0

OTF
POSTGRADUATE IN 3D PRINTING ARCHITECTURE

FACULTY
COLLABORATIVE ENTITIES

4.1

ARETI MARKOPOULOU

IAAC ACADEMIC DIRECTOR
MACT PROGRAMME DIRECTOR
& STUDIO FACULTY

ALEXANDRE DUBOR

DIRECTOR
TECHNÉ

EDOUARD CABAY

DIRECTOR
STUDIO

JOAQUIM MELCHOR

SENIOR FACULTY
MATTER

JOSEP RAMON SOLER

ADVISOR - WINDMILL

KUNALJIT CHADHA

ROBOTIC FABRICATION
EXPERT

MATHILDE MARENGO

IAAC HEAD OF STUDIES
METHODOLOGY ADVISOR

MARCO INGRASSIA

ACADEMIC COORDINATOR

EUGENIO BETTUCCHI

STUDIO ASSISTANT

4.2

COLLABORATIVE
ENTITIES

WINDMILL STRUCTURAL CONSULTANTS

Windmill Structural Consultants is a consultancy whose activity is rooted in the study of the science of structures with the aim to be able to provide a true and personalised answer to every problem. In this sense, the work of Windmill is also based on the development of structural analysis software, which its founders have been working on for 15 years, and which allows, through appropriate and constant adjustments, the analysis of specific or atypical problems, either by geometry, by construction process or the materials used. Furthermore, we understand and wish to influence the understanding of, structural problems in an open and debatable manner, and as being, sometimes, a fundamental part of the architectural proposal.

tecnalia Corporación Tecnológica

CERÀMICA CUMELLA

SANTA & COLE

CRICURSA

Tecnalia is a private, independent, non-profit applied research centre of international excellence. The whole team at Tecnalia has one goal: to transform knowledge into GDP, meaning wealth to improve people's quality of life by generating business opportunities for industry. Tecnalia is committed to generating major impacts in economic terms, by means of innovation and technological development, addressed by 6 business divisions, covering economic sectors of Energy, Industry, Transportation, Construction, Health and ICT. Tecnalia has been granted over 250 patents and promoted more than 30 spin-off companies.

The family workshop CERÀMICA CUMELLA, founded in 1880 in Granollers (Barcelona), originally devoted to the manufacturing of traditional ceramics and pottery for daily use, has finally become the central core of an intense public and professional activity. Ceràmica Cumella has lately experienced a notorious increase in the industrial production of serial pieces -floorings, socles, lattices, coatings, steps, modular elements undoubtedly specific in many cases since they are ordered pieces. Cumella with the conviction of a necessary integration of technical tradition and innovative process, encouraging with a steady hand and continued research, for example, on the definition of colours and the manufacturing of the corresponding glazes, both for mechanical or manual applications; or on finding solutions on how to keep up with present technological requirement.

For 28 years now, Santa & Cole has lived for industrial design, an art consisting of focusing on everyday objects in order to seek a better use experience, thereby leading us to reflect upon material culture. Santa& Cole generates elements of domestic and urban furniture and lighting, plant elements (living matter) and books (likewise alive). A range that is only apparently dispersed, converging upon a single concern: not to accumulate, but rather to select; not to enjoy quantity, but rather quality. Santa & Cole is organised around four core themes: 1. Strategy, Structure and Knowledge, 2. Editing Policy, 3. The Importance of Design for Santa

CRICURSA was founded in 1928 with the intention of bringing form, material and processing into high technology glass bending, in order to explore the possibilities of bent glass as a decorative element. After more than 80 years of experience, it now offers architectural glass, curved and flat interior and exterior glass, and is present in many of the most famous architectural works around the world. Passionate about architecture, creativity and innovation, their aim is to continue inspiring the best engineers and architects in the world, in close collaboration with Facades and installers and all professionals, partnering CRICURSA to the efficiency and capacity to deliver ideas and concepts of the designers.

5.0

OTF
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GENERAL INFORMATION

TUITION
FEES

INSTITUTE FOR ADVANCED ARCHITECTURE OF CATALONIA

OPEN THESIS FABRICATION

TUITION FOR STUDENTS ATTENDING OTF (45 ects: 6 Months)

Tuition for the year 2019/2020 is:
Non-EU: 9.500€
EU: 7.600€.
Discount for PhD in related research fields. The selected candidates must send to the Institute a scanned proof of a down payment of 300€ to confirm participation, maximum 4 weeks after their acceptance.

All payments of the selected programme must be paid by bank transfer only to:

**Bank: Santander
Agency: 6784
IBAN – ES55 0049 6784 3226 1615 5632
SWIFT – BSCHESMMXXX
Holder : Institut d'Arquitectura Avançada de Catalunya.
Address: Via Augusta, nº182 (Es 08021 Barcelona)**

Note: Make sure that bank transferring SUBJECT is the applicant's name, and not the person who orders the transfer. Also make sure to select the SWITF instructions code "OUR" when ordering the bank transfer. This means that you have to pay the transfer charges.

APPLICATIONS

To apply for IAAC, please fill out and submit the online applications form (www.iaac.net/iaac/apply) for the programmes: MAA01, MAA02, MaCT01, MaCT02, MAI, MAA01 + OTF, OTF, MAEB, MRAC, MDEF.

For the online application, the following required documents should all be submitted in English, with the exception of the undergraduate diploma (All documents must be uploaded onto the designated space on the online application form in PDF format).
A letter of intent expressing the reasons for which you wish to attend the chosen master – Written in English, PDF and with a maximum of two A4 pages.
Curriculum vitae
Portfolio, showing samples of your work –maximum of 10MB.
Two letters of recommendation (from professional or academic referees) – In English, PDF and with the corresponding referee contact information.
A copy of your highest academic degree.*If you haven't graduated and therefore your diploma is not available at the moment of your application, you will need to send a letter in English or Spanish emitted by your University acknowledging that you are currently studing (name of the programme) and will graduate in (specific date).
A copy of a valid passport (copy of valid I.D. is accepted for citizen of member states of the EU) *If you hold more than one passport bear in mind that the one

you provide in the application form is the one IAAC will use for your acceptance letter and therefore the one you will use to apply for your Spanish visa (non EU students) and NIE (all students).
*Bear in mind that you can apply with a copy of your title but If you are accepted you will be required to send a legalised copy of your degree and an official SWORN translation of it in Spanish. More info about SWORN translation and legalisation in the "FAQ" section in IAAC's website.
*If you have not yet graduated, but will be graduating before the commencement of the academic year to which you are applying at IAAC, you are still eligible to apply. However, to complete the application process, you will need to provide the document explained in the section 5 above.
If you have any questions or doubts with regards to the application process, please feel free to contact us at applications@iaac.net

GRADING SYSTEM

Class attendance is obligatory for studios and seminars. In both cases, courses are graded as follows:

0–4.9 Fail (this means that the student is not going to get his/her Master's Degree, this grade will be justified and well explained)
5.0–6.9 Passed
7.0–8.9 Good
9.0–10 Excellent/Distinction

- Under no circumstances will students be excused from presenting their design work at the final review of a project.

- Diplomas will not be delivered to students with any incomplete in their final grades.
In addition to the above, Midterm Reviews will be held with the members of the faculty in order to inform each student briefly of the general feelings of the faculty about his or her work. Suggestions may be given on how to prepare for the Final Review

STUDENT FEEDBACK & EVALUATION

The usual procedure IAAC uses for the collection and analysis of information to ensure the quality of the programme is the student surveys and evaluation reports. IAAC performs two different types of surveys: one survey is specific for each course, and is being made immediately after a course finishes, and the second survey is a general survey, which is conducted at the end of the academic year. Course Survey: The surveys contain questions related to course content and structure of the class, the methodology used and the level of facilities where the course has been conducted. There are also questions about the faculty , allowing the student to evaluate the faculty's communication capabilities, the capacity of synthesis and organise the content structure as well as the faculty's competence in assessing and explaining the results obtained. The survey also include questions about the relevance of the class with respect to the students own interests and the relevance with the general research agenda of the Master programme. Students are also asked within this survey to suggest improvements in the courses that IAAC takes into consideration for the future editions. General Survey: The general annual survey refers to the overall management of the programme and the efficiency of the entire organisation. It includes questions of whether students had difficulties in the application and admission process, whether they had problems in acquiring all necessary certificates and/or other documents and more. It also includes question of satisfaction in relation with the efficiency level of IAAC staff, whether faculty and content have met their expectations, and whether they were satisfied with the level of access to facilities and material resources at the Institute . Also, students are asked what course or activities considered more interesting and relevant to the programme and they are also asked to express ideas for overall improvement.

STUDY EXPENSES

Study-related expenses such as the purchase of books, graphic reproduction, printing and model moking are not included in the tuition fee.
For field trips and excursions an individual financial contribution may be required.

MATERIALS

Students are expected to bring their ownly a laptop computer no more than two years old, with the following specifications:
Processor: Computer with Intel i5 or i7 processor or AMD Equivalent
Ram: 8GB
Hard Disk: 200GB + HDD
Operating System: Windows 10, 8.1 or 7 SP2 - 64 BIT
Note: If you have an Apple computer, it is required that you install Windows on Boot Camp which will perform better than Parallels or VMWare. Please do this prior to your arrival in Spain).

NON EUROPEAN STUDENTS

Non European students accepted to the programme are advised to contact the nearest Spanish Embassy to start the Visa procedure. Be aware that the application procedure for a Student Visa can take up to 3 months.

MEDICAL INSURANCE

Participants are responsible for their own health insurance and other personal insurance. It is mandatory to acquire a Medical Insurance to cover your stay here in Barcelona. The Catalan Public Health System does not cover students, and will charge you for any visit or consultation. Please note that the IAAC is not liable for loss or damage to personal belongings.

6.0
THE
INSTITUTE

6.1
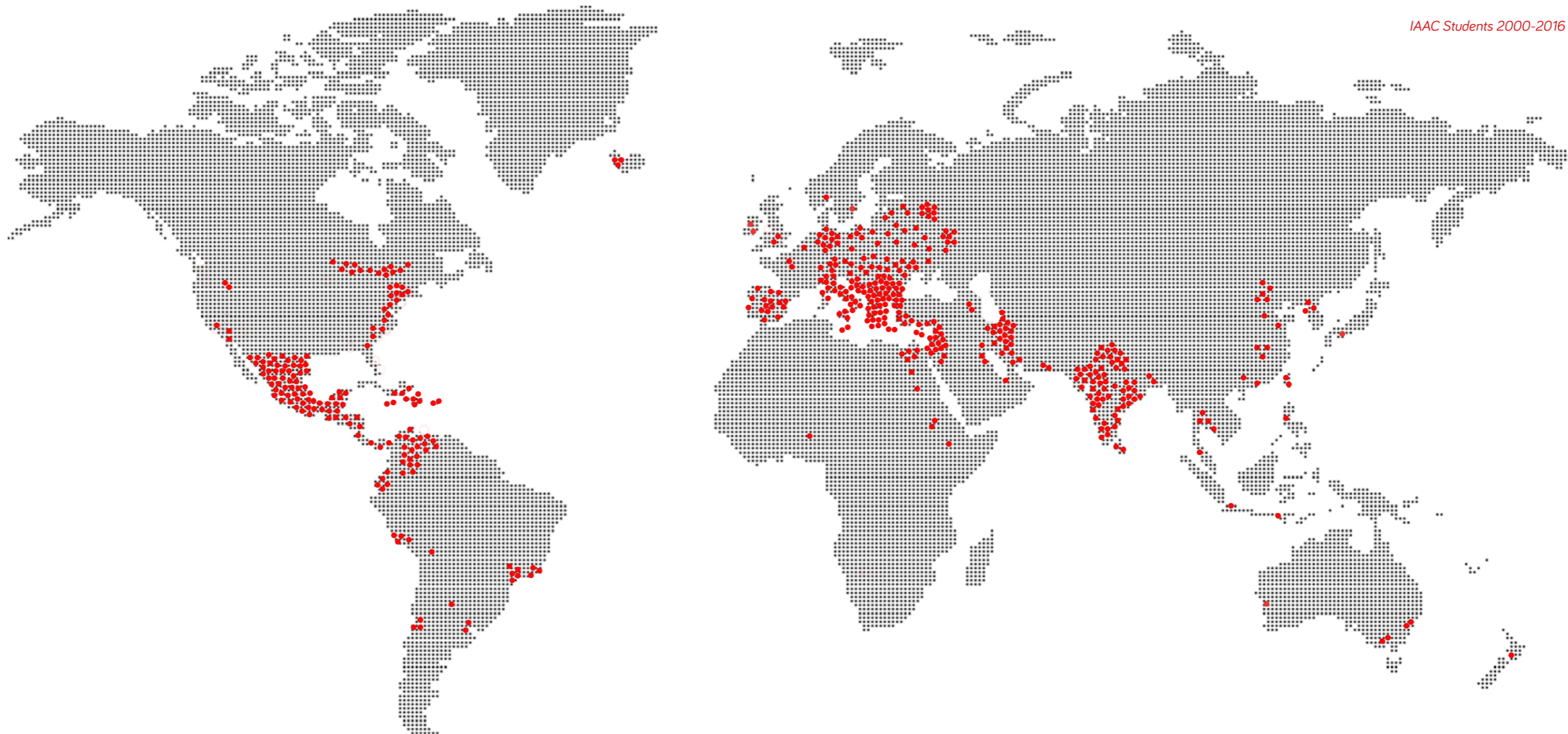
THE INSTITUTE

The Institute for Advanced Architecture of Catalonia – IAAC is an international centre for Education, Fabrication and Research dedicated to the development of architecture capable of meeting the worldwide challenges in constructing 21st century habitability.
Based in the 22@ district of Barcelona, one of the world's capitals of architecture and urbanism, as well as the European Capital for Innovation (2014), IAAC is a platform for the exchange of knowledge with researchers, faculty and students from over 60 countries around the world.

IAAC is Education, with the Master in Advanced Architecture, Advanced Interaction and the Master in City & Technology giving the next generation of architects and professionals the space to imagine, test and shape the future of cities, architecture and technology. This is possible through Open Thesis Fabrication, the implementation of Applied Research and allowing learning by doing, as well as through short programmes, implementing global agendas developed through local solutions, such as the Global Summer School.
IAAC is Fabrication, with the Fab Lab Barcelona, the most advanced digital production laboratory in Southern Europe, a laboratory where you can build almost everything, that recently hosted Fab10, the 10th annual worldwide Fab Lab conference.
IAAC is Research, with Valldaura Labs, a self-sufficient research centre located in the Collserola Metropolitan park, 20 minutes from the centre of Barcelona,

where a series of laboratories are implemented for the production and testing of Energy, Food and Things.

And IAAC is also Barcelona, the European Capital for Innovation (2014)1, the city that aims to be a self-sufficient city, a Fab Lab city, a smarter city. Thanks to its innovative visions, IAAC is strategically aligned to the new urban policies of the city, developed in close collaboration and mutual inspiration between the two entities. The Institute develops multidisciplinary programmes that explore international urban and territorial phenomena, with a special emphasis on the opportunities that arise from the emergent territories, and on the cultural, economic and social values that architecture can contribute to society today.
IAAC sets out to take R+D to architecture and urbanism and create multidisciplinary knowledge networks. To this end the institute works in collaboration with several cities and regions, industrial groups, research centres, including the City Council of Barcelona, the Collserola Natural Park, the Massachusetts Institute of Technology (MIT), the Centre for Information Technology and Architecture (CITA), the Southern California Institute of Architecture (Sci-Arc), as well as diverse companies among which CISCO, Endesa, Kuka Robotics and many others. Together with these the Institute develops various research programmes bringing together experts in different disciplines such as architecture, engineering, biology, sociology, anthropology and other fields of investigation.
IAAC has made its name as a centre of international reference, welcoming students and investigators from over 60 different countries among which Australia, the USA, India, Brazil, Russia, Ethiopia, all European countries and many others.

6.2

MISSION, VISION & VALUES

MISSION

The Institute for Advanced Architecture of Catalonia (IAAC) is a vanguard academic and research centre whose mission is to promote scientific and technological innovation in the conception, design and construction of the human habitat, at all scales (from bits to geography), integrating technological, social and cultural innovations of our time and contributing to the consolidation of Barcelona as a global platform for the urban habitat.
To this extent IAAC works with a multidisciplinary approach, facing the challenges posed by our environment and shaping the future of cities, architecture and technology.
This is obtained through the focus on select criteria:
- Design for Self-sufficiency
- Application of ICT (Information and communication technologies) at all levels of daily life.
- Contribution to the distributed networks in the conception of the environment.
- Advanced digital and parametric design.
- Digital and Robotic Fabrication

VISION

IAAC encourages innovation and construction of the human habitat, offering a working environment in the following areas:
- Education through academic programmes for graduate students and international faculty and students, continuous education programmes in design, interaction, architecture, urbanism and landscape.
- Research by developing projects to expand the boundaries of architecture, in collaboration with experts from multiple disciplines.
- The development of innovation projects with companies and institutions that define role models, responding to global realities.
- The promotion of projects through publications, exhibitions and competitions developed physically and virtually.
For all this, IAAC works with local and global organisations participating in multidisciplinary knowledge networks. It promotes transformation from its humanistic ideology based on learning by doing.
The Institute for Advanced Architecture of Catalonia (IAAC) is a vanguard academic and research centre whose mission is to promote scientific and technological innovation in the conception, design and construction of the human habitat, at all scales (from bits to geography), integrating technological, social and cultural innovations of our time and contributing to the consolidation of Barcelona as a global platform for the urban habitat.
To this extent IAAC works with a multidisciplinary approach, facing the challenges posed by our environment and shaping the future of cities, architecture and technology.
This is obtained through the focus on select criteria:
- Design for Self-sufficiency
- Application of ICT (Information and communication technologies) at all levels of daily life.
- Contribution

VALUES

COMPACT
An organisation that is flexible, agile, quick and able to anticipate new challenges of our time.

INDEPENDENT
Private foundation that collaborates with individuals, universities, companies and public organisations to innovate the human habitat and interaction.

GLOBAL
In thought and action, in the origin of human capital, learning from the diversity of the world, promoting the construction of local realities with very specific identity.

INFORMATIONAL
Recognition of digital systems as a technological base that transforms our world today, integration of technologies and processes associated in all areas of their action.

NATURAL
Promoting connected self-sufficiency, according to the rules of biological ecosystems, to help build a more ecological and social world.

HOLISTIC
Broad overview of the conception, design and construction of the human habitat, and this works at all scales, in interaction with multiple disciplines.

SOCIAL
Important social base, from interaction with individuals, companies and organisations that promote innovation in the construction of the human habitat, prioritising talent and avoiding social and economic stigmatism.

1. http://ec.europa.eu/research/innovation-union/index_en.cfm?section=icapital

6.3

IAAC
OBJECTIVES

MODERNISM
7 works by Gaudi are UNESCO World Heritage sites.

IMAGE
Almost 2.500 film shoots took place in the city during 2015.

CULTURE
50 museums and exhibition centers, Palau de la Musica, Sonar, Primavera Sound etc. Barcelona is part of the Network of UNESCO Creative Cities as City of Literature since 2015.

SPORT
In addition to the pulling force of FC Barcelona, the city also hosts several international sporting events each year; these include the X Games, the World Swimming Championship etc.

PROFITABLE
Since 2000, Barcelona has been the top European city in terms of the quality of life of employees (Report by Cushman & Wakefield and Cinco Dias).

TOURISM
More than 15,5 million foreign tourists visited Barcelona in 2015.

AFFORDABLE
Barcelona is not among the world's 50 most expensive cities (according to Mercer Human Resource Consulting).

MOBILE
The city will continue to host the Mobile World Congress (MWC) until 2018. Barcelona welcomes more than 70.000 visitors during this annual event.

6.4

BARCELONA IS..

– To underline and reinforce our position as a worldwide reference for education and research, as well as for self-sufficiency and digital fabrication, through the consolidation and expansion of research projects, as well as offering up to date and evolving academic programmes.

– To expand our collaborations with strategic public and private partnerships both nationally and internationally.

– To strengthen our consultancy role by creating specific alliances with industries that promote and support applied research.

– To actively pursue an agenda of activities related to green architecture, sustainability and renewable energies through the development of the Green Fab Lab, the Food Lab and the Energy Lab.

– To enhance our current work and profile as a specialised think tank for innovative strategies within the fields of urban planning and urban design with particular attention to the Smart Cities challenge.

6.5

22@

The Institute for advanced architecture of Catalonia is located in the Poblenou neighbourhood of Barcelona, in the recently created district known as 22@, a focus for companies and institutions oriented toward the knowledge society. The neighbourhood is close to the historic centre, the seafront, the Plaça de les Glòries and the Sagrera APT station, making it the most dynamic enclave in the city.

IAAC is housed in an old factory building, with 2,000 m² of space for research, production and dissemination of architecture, so that the space itself is a declaration of principles, embodying an experimental and productive approach to architecture. The IAAC premises include the Fab Lab Barcelona, an architecture and design oriented fabrication laboratory which is part of the global network of Fab Labs set up by The Center for Bits and Atoms at MIT. The Green Fab Lab, hosted in IAAC's forest campus in the Valldaura Labs, is also part of the same global network, a fabrication laboratory this time oriented towards self sufficient and productive solutions.

Iaac
Institute for advanced architecture of Catalonia

IAAC CAMPUS

Valldaura is IAAC's second campus located in the Collserola Park, the natural centre of the metropolitan area of Barcelona. Valldaura campus is a large park and testing ground for innovation that features the latest technologies in the fields of energy, information and fabrication. The core of this innovative project developed by IAAC is a laboratory to implement investigation and set a new bench mark for self-sufficiency.
The Valldaura Self Sufficient Labs express a new concept for sustainability established by IAAC. Its aim is to create a sustainable, consciously designed ecology using both cutting edge technology and traditional craftmanship.
Valldaura Self Sufficient Labs Centre is at the forefront of developing a new concept of habitability placing people as the centre of all actions.
Local self-sufficiency is promoted in the use of the environment, and the expansion of knowledge is promoted through the participation in global information networks to share and generate progress.
The Valldaura Self Sufficient labs and its three Laboratories, Food Lab, Energy Lab and Green Fab Lab; allow to research the specificities of the production of key elements involved in self-sufficiency: food, energy and things, combining ancestral knowledge that connects us to nature with the latest advanced technology.

LONG TERM

IAAC Educational Programmes give the next generation of architects the space to imagine, test and shape the future of cities, architecture and technology through applied research, learning by doing, and implementing global agendas developed through local solution.

IAAC is also part of the European consortium InnoChain, a consortium of six renowned research institutions and 14 leading industry partners: an interdisciplinary network developing PhD research in innovative building design practice under the Horizon 2020 programme.

MAA01 - 1 year, 75 ects
MASTER IN ADVANCED ARCHITECTURE

The MAA01 - Master in Advanced Architecture Programme is oriented to graduates who wish to commit and develop their design research skills in the context of new forms of practice within architecture and urbanism, ranging from large scale environments to tectonic details and material properties. In order to allow the highest quality and applied research, the Masters in Advanced Architecture proposes a multidisciplinary approach, considering architecture as a transversal field, for which it is imperative to integrate all research and applications with the knowledge of specialists form a diversity of fields of expertise.

The MAA01 emerges as an Innovative Structure focusing on five select Research Lines all led by Internationally renowned experts, and bringing together students and faculty from different disciplines and origins, towards the creation of a Networked Hub dedicated to Research and Innovation for the habitability of the 21st Century.

The programme is organised in four phases:
three terms and the final project development phase.

MAA02 - 2 years, 130 ects
MASTER IN ADVANCED ARCHITECTURE

The MAA02 programme combines the first year Master (MAA01) with a second year of investigation towards the development of a thesis project. This programme allows senior students, already having developed the appropriate sensibility and tools from MAA01, to get further a personal investigation, around the themes of the advanced technology, architecture and urbanism. During this second year students are required to deal with a project counting on the possibility of developing it with international faculty and enterprises, highly specialized in different fields.

During the second year each student will propose and develop his/her Individual Thesis Project through an academic programme structured in:
- Individual Tutoring with internationally renowed experts that will support the student in the development and in the theoretical definition of the thesis project
- Seminars focused on the topics of Advanced Digital Tools, Research Methodology and 1:1 Fabrication

The thesis, sumbitted in publication format, can be developed according to diverse research methodologies.

MACT01 - 1 year, 75 ects
MASTER IN CITY & TECHNOLOGY

The Institute for Advanced Architecture of Catalonia (IAAC) is launching an EU accredited Master programme in City & Technology (MaCT). In an effort of understanding the needs for the habitability of the 21st century cities and the significant role of technology for the formation of the new urban environments IAAC proposes a new Master programme oriented in training Change Makers that City Government Administrations, the Industry and Communities need in order to develop projects for the transformation of the cities.

The Master programme represents an effort of facilitating the exchange of knowledge and the mutual learning of urban experiences among cities.

MaCT foresees new city economy and new city management models for the creation of a decentralized, productive and social city of the future.

MACT02 - 2 year, 120 ects
MASTER IN CITY & TECHNOLOGY

With the objective of furthering the research developed in the first year of the MaCT01 programme, IAAC launches the MaCT02. Throughout the MaCT02 programme students will have the opportunity to work on an individual thesis focused on the development of a pilot project, allowing them to fully engage with both the theoretical and practical aspects of the project. The students will also follow associated seminars amplifying their knowledge of technologies associated to the urban context, allowing them to integrate these in the development of holistic projects, mixing technology with social, economic and environmental benefits.

The individual thesis, or pilot project, will allow the students to gain in depth knowledge on elaborating disruptive urban proposals that use technology to better citizens' quality of life. Additionally, through the development of the individual thesis based on a real case study, students will have the opportunity to collaborate with industrial and governmental representatives, among the collaborative entities of the MaCT programme, giving students the necessary support and knowledge to develop solutions for the real world.

MAEB - 11 MONTHS, 90 ECTS
MASTER IN ADVANCED ECOLOGICAL BUILDINGS
IMMERSIVE PROGRAMME

Current discourses on sustainability and design do not yet adequately frame questions of energy and ecology. Whether you consider how building design overlooks landscape and urbanisation interdependencies; or incomplete interpretations of the ecological processes that could otherwise better support building, urbanisation, and life today; or how the material choices in buildings are governed by stylistic abstract notions instead of something ecologically more powerful, the Master in Advanced Ecological Buildings aims for a more ambitious and comprehensive approach of energy and ecology for the built environment.

Following up the urban research carried out by IAAC in the last years in fields like Solar Housings, Eco neighbourhoods, Internet of Energy, Hydrogrid, Digital Fabrication, the immersive Master in Advanced Ecological Buildings (MAEB) aims at training professionals in the design, prototyping, and fabrication of buildings as ecological and thermodynamic systems.

The iimmersive programme takes place in Valldaura Labs, IAAC's campus located inside Collserola Natural Park in Barcelona

INSTITUTE FOR ADVANCED ARCHITECTURE OF CATALONIA

OPEN THESIS FABRICATION

EDUCATIONAL PROGRAMMES

MRAC - 1 YEAR, 75 ECTS
MASTER IN ROBOTICS AND ADVANCED CONSTRUCTION

With the Master in Robotics and Advanced Constructions (MRAC), IAAC seeks to train a new generation of interdisciplinary actors capable of facing our growing need for a more sustainable and optimised construction ecosystem. The Master is focused on the emerging design and market opportunities arising from novel robotic and advanced manufacturing systems.

Through seminars, workshops and studio projects, the master programme challenges the traditional processes in the Construction Sector; it investigates how robotics and new digital fabrication tools change the way we build, and develops the design tools and processes for such new productions methods.

The master offers an international and multidisciplinary environment in which Engineers, Designers, Architects, Craftsmen, Academics and Industry partners must rethink the construction industry. The master will take place in IAAC, a creative space fully equipped with the latest manufacturing technologies, based in Barcelona, an International hub for innovation in a traditionally rich industrial region.

MDEF - 1 YEAR, 75 ECTS
MASTER IN DESIGN AND EMERGENT FUTURES

The aim of the Master in Design for Emergent Futures (MDEF) is to provide the strategic vision and tools for designers, sociologists, economists and computer scientists, to become agents of change in multiple professional environments. This programme focuses in the design of interventions in the form of products, platforms and deployments in the context of emerging future scenarios in society and industry.

Students will be encouraged to work at multiple scales (product, platforms, strategic planning and distribution strategy) in order to create prototypes to be tested in the real world. The theoretical and practical contents in this programme propose an exploratory journey aimed to comprehend and critique the role of disruptive technologies -including digital fabrication, blockchain, synthetic biology, Artificial Intelligence, among others, in the transformation of the established order.

The programme is recommended for designers, sociologists, computer scientists, economists, anthropologists, technology entrepreneurs and changemakers who are looking to develop an interdisciplinary career path to conceive and produce impactful ideas to transform the world. This Master has a high component of hands-on learning and project-based learning where students will be requested to turn big ideas into design strategies, prototypes and interventions to be tested in the real world, focused in Barcelona but connected globally with other cities.

OTF - 6 MONTHS, 25 ECTS
OPEN THESIS FABRICATION

The aim of the programme, in line with the opportunity of making a difference, is to develop research to be applied through patents or products for marketing. This will be obtained through the common goal of researching of different fabrication techniques, materials and form, towards the implementation of a large scale prototype, understanding the potentials of digital fabrication together with new needs of current society and the market.

All the IAAC BUILDs researchers will be working together in 1 group towards a collective goal and project, in turn subdivided into different specialized research teams each focusing on a specific aspect of the project's development. Hence the implementation of a 1:1 scale prototype allowing to test techniques and materials on real scale.

IAAC BUILDs follows in the footsteps of OTF developing the applied research in partnership companies, whose involvement will vary according to project focus. The program mealso counts on the collaboration of experts in various fields such as engineering and structures, materials, technical components, and much more, allowing the development of a full scale and fully functioning prototype.

VISITING PROGRAMS

Every year, IAAC organises and takes part in a number of international educational programmes and projects. IAAC annually participates in Global Architecture & Design exchange programme organised by CIEE, international education and exchange centre. Global Architecture&Design Programme simultaneously runs in three locations: Barcelona, Berlin and Prague. Students are working with leading architecture and design experts and innovators to complete a real world design project within an emerging global context. This programme aims to pursue hands on design work in a state of the art studio using the latest technology to address an aspect of the current global environmental crisis.

GSS
GLOBAL SUMMER SCHOOL

The Global Summer School (GSS) is a platform defined by ambitious, multiscalar investigation into the implications of emergent techniques on our planned environments. The programme develops a global agenda in various institutions around the world, each focussing on developing localised solutions.International teams located in key cities around the globe explore a common agenda with projects that are deeply embedded in diverse local conditions. This intensive two week course connects each participant to ongoing research agendas in robotics, simulation, physical computing, parametric design, digital fabrication, and other relevant emerging design methodologies.

The programme focuses on a global agenda developing local solutions.

FAB ACADEMY

Fab Academy is an intensive six month programme that teaches students to design, prototype and invent almost anything using digital fabrication tools and machines. The Fab Academy brings together a multi-disciplinary and hands-on learning experience that can be taken in any number of participating Fab Labs (digital fabrication labs) around the world. At it's core, Fab Academy Barcelona empowers students to learn by doing, inspires them to make stuff locally, and to become active participants in sustainable cities and communities such as Barcelona's Poblenou district.

The course is directed by Neil Gershenfeld from MIT's Center For Bits and Atoms and based on MIT's rapid prototyping course: How to Make (Almost) Anything. Since 2001, they have been at the cutting edge of the global maker movement; enabling innovation and democratising the use of digital fabrication technology through the growing network of Fab Labs around the world.

6.7

FAB LAB BARCELONA

FabLab Barcelona is one of the leading laboratories of the worldwide network of Fab Labs, a small scale production and innovation centre equipped with digital fabrication tools and technologies for the production of objects, prototypes and electronics.

Fab Lab Barcelona is part of the Institute for Advanced Architecture of Catalonia, where it supports different educational and research programme related with the multiple scales of the human habitat. It is also the headquarters of the global coordination of the Fab Academy programme in collaboration with the Fab Foundation and the MIT's Center for Bits and Atoms; the Fab Academy is a distributed platform of education and research in which each Fab Labs operates as a classroom and the planet as the campus of the largest University in construction in the world, where students learn about the principles, applications and implications of digital manufacturing technology.

The Fab Lab Barcelona has produced projects such as Hyperhabitat IAAC (official selection for the Venice Biennale XXI) or the Fab Lab House (Audience Award in the first Solar Decathlon Europe in Madrid). It is currently developing projects of different scales, from smart devices for data collection by individuals (Smart Citizen innovative project award in the Smart City Expo and World Congress in Barcelona), the development of the new generation of Fab Labs in the Green Fab Lab project, to the new production models for cities with the Fab City project being implemented in Barcelona in collaboration with the city council.

Fab Lab's 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. Community organisations, educational institutions and non-profit concerns are our primary beneficiaries.

INSTITUTE FOR ADVANCED ARCHITECTURE OF CATALONIA

OPEN THESIS FABRICATION

VALLDAURA GREEN FABLAB

As a part of the Fab City network, the Green Fab Lab works towards the creation of a self-sufficient habitat and research centre at Valldaura Self Sufficient Labs, one of IAAC's campus locations.

Located in the Collserola Natural Park, in the heart of the metropolitan area of Barcelona, it has laboratories for the production of energy, food and things, and develops projects and academic programmes in association with leading research centres around the world.

As part of IAAC's commitment to promoting and advancing habitability in the world based on ecological principles and making the fullest use of all available technologies and resources, we have created a research centre focused on the idea of self-sufficiency, with a view to provide a worldwide point of reference. The Green Fab Lab offers an opportunity to learn directly from nature to bring that understanding to the regeneration of 21st century cities.

FAB LAB PROGRAMMES

BIO ACADEMY

Bio Academy offers education on the implications and applications of synthetic biology. Students with no experience in any of the fields thereof are encouraged to first gather some experience in a DIY bio lab, or via online courses, but there is no need for any official accreditation to sign up for the course.

How to grow almost anything (Bio Academy) is a Synthetic Biology Program directed by George Church, professor of Genetics at Harvard medical school. The HTGAA is a part of the growing Academy of (almost) Anything, or the academany.

FAB ACADEMY

Fab Academy is a distributed educational model providing a unique educational experience. It consists of a 5 month part-time student commitment, from January to June. The Fab Diploma is the result of the sum of Fab Academy Certificates. Progress towards the diploma is evaluated by a student's acquired skills rather than time or credits.

The Fab Academy is a fast paced, hands-on learning experience where students plan and execute a new project each week. Each individual documents their progress for each project, resulting in a personal portfolio of technical accomplishments.

At the Fab Academy, you will learn how to envision, prototype and document your ideas through many hours of hands-on experience with digital fabrication tools. We take a variety of code formats and turn them into physical objects.

FAB KIDS

The Fab Kids, is a creative laboratory that favours the development of intelligence, creativity and imagination of children and youth. It is a place where thinking is encouraged and innovation occurs, a space where educational and recreational activities take place, focused on design and digital fabrication.

TEXTILE ACADEMY

Fabricademy is 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 and the upcoming wearable market. The two phase program will last 6 months, with approximately 3 months of seminars and learning modules and three months focusing on individual in depth applied project research.

The methodology and network developed in 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.

WORKSHOPS

Fab Lab Barcelona offers a programme of workshops focused both on specific aspects of Advanced Digital and Robotic Fabrication, as well as spreading knowledge and empowering citizens and creative people. Some of the latest workshops include: Computational couture, 3d printing, building with robots, cutting and blending, extreme manufacturing, making things talk, mould's fabrication and object production, networking environmental robotics (NERO), and much more.

6.8

SPECIAL

PROJECTS

As part of IAAC's commitment towards the investigation of new and emerging areas of the Architectural discipline, pilot projects are launched on a yearly basis. These projects, such as the Fab Lab House (1) , the Endesa Pavillion (2), Hyperhabitat (3) and Smart Citizen Kit (4), operate in the field between academia, architectural practice and information technologies, and are designed and fabricated by IAAC faculty, students and collaborative companies.

These projects operate on several scales, from 1:1 architectural interventions to pocket sized microprocessors, all sharing a common vision of investigation towards a more sustainable and socially empowering design approach. All projects have been welcomed with considerable success, with various distinctions in events such as the Solar Decathlon and the Venice Biennale, as well as being published in several reviews and publications. In the development process of these pilot projects, IAAC collaborates with a network of partners from various disciplines, including leading universities and innovative companies.

SPECIAL
PROJECTS

RESEARCH 2014/2017

2017 - CONSTRUMAT

The twentieth edition of Barcelona Building Construmat, put a particular emphasis on innovation and new technologies. IAAC played a central role in the Future Arena of the fair, where the Institute could showcase its most recent research projects about additive and robotic manufacturing applied to the construction sector: **On Site Robotics**, the project born from the collaboration between IAAC and Tecnalia with the participation of Noumena, on-site construction of a 3D printed pavilion made with 100% natural materials, which has been completed in only four days.

2016 - IN3DUSTRY

This is an international event, focusing on the current state and future of Additive and Advanced Manufacturing.
The event, co-organised by IAAC Fab City Research Laboratory and Fira Barcelona, is a global hub bringing together all components of the Additive Manufacturing ecosystem to showcase the latest technologies and innovations.

2015 - BEYOND //
INNOVATION PAVILION

The Pavilion of Innovation 2015 in Beyond Building Barcelona, curated by IAAC | Fab Lab Barcelona, presented new ideas and construction paradigms emerging from international excellence in research and pilot projects, forming the basis of future buildings and cities. Novel and reactive materials, advanced digital/robotic manufacturing techniques and responsive environments were the key topics presented, towards shaping the future of the building industry.

IN(3D)USTRY
FROM NEEDS TO SOLUTIONS

EVENTS

SPECIAL

PROJECTS

RESEARCH 2014/2017

2018 -PLAYBALL! // LLUM BCN

Playball! is an interactive art light installation that engages a big number of users that play together to create a visual and aural experience. Playball uses light to create interactions between the viewer and installation, and between the viewers themselves.

2017 -BRILLEN EN LA FOSCOR // LLUM BCN

Located in an enclosed patio in the Gothic quarter of Barcelona, the installation, an interactive audiovisual instrument, transforms the space through a musical performance based on citizen participation. The visitor enters the patio space and is invited to play with the strings of light, composing musical melodies based on the citizens' real time interaction.

2016 - LLUM TAFANERA // LLUM BCN

La Llum Tafanera, The Curious Light, was an interactive kinetic light installation that wanted to make technology more friendly and closer to the public through the simulation of the personality of a star. IAAC once again had the honour of being invited to participate in the Llum BCN Urban Light Festival in Barcelona.

2015 - PLUJA DE LLUM // LLUM BCN

The Llum Bcn festival of lights takes place each year in February. For the 2015 edition, IAAC created an illuminated installation that combines art, tradition and technology. The concept of the installation follows a mixture of the elements of the tale of Santa Eulalia, in particular her tears, transforming these into conceptual rain. A rain of light, emanating from translucent vertical elements interacting with sounds and music.

2014 - DATANET // LLUM BCN

For the Llum Bcn 2014, in the courtyard of the Museu Frederic Marés in Barcelona, IAAC 'plants' DATA NET, a new artificial tree, forming an interactive mesh. The intensity of light of the installation changes, reacting to the location and the density of the visitors through a series of sensors that track peoples' movement.

LLUM BCN
INSTALATIONS

SPECIAL

PROJECTS

RESEARCH 2014/2017

2017 - SUPERBARRIO // SUPERILLA

SuperBARRIO is a videogame that boosts participatory design processes Developed as an open source video game for smartphone and tablets, it is a tool for architects and public entities to engage the citizens in the design of the public space, to educate to sustainability and inclusiveness, and to collect data about the citizens' needs, desires and proposals

SuperBARRIO is a flexible tool that can be applied to different neighborhood. Pilot projects have been developed for the Superilla Pilot Barcelona, and for the Gavoglio area in Genoa, Italy.

2016 - POBLEJOC // SUPERILLA

Poblejoc, an interactive installation conceived during the Active Public Space workshop, was designed as an Urban Game with the aim of activating public space. Poblejoc was created in the framework of the #Superilla (Super-block) workshop, a pilot test of the Superilla plan for Barcelona, that was developed in the Sant Martí district. The plan aims to close a part of the cities roads to traffic, allowing to use these new pedestrianised areas as public space.

2014 - LIBERTY

Designed and fabricated for the Re.Set festival, a circuit of ephemeral architecture in the streets of Barcelona., Liberty follows the concept of FREEDOM. Knowledge provides freedom and progress; and the power of freedom is expressed through reading. This installation consists of three different trees whose trunks and branches are made of steel, while the leaves are made of books, and the earth made of concrete. Liberty activates a new public space; a shady bench and a new interactive area in the city centre.

ACTIVE
PUBLIC SPACES

SPECIAL PROJECTS

RESEARCH 2014/2017

2017 - 3D PRINTED BRIDGE

The first pedestrian, 3D printed bridge in the world was inaugurated on December 14th in the urban park of Castilla-La Mancha in Alcobendas, Madrid.
The Institute for Advanced Architecture of Catalonia (IAAC) was in charge of the architectural design of the bridge, which has a total length of 12 meters and a width of 1.75 meters and is printed in micro-reinforced concrete. The 3D printed bridge, which reflects the complexities of nature's forms, was developed through parametric design, which allows optimising the distribution of materials to minimise the amount of waste by recycling the raw material during manufacture.

2017 - NOMAD FOLDING FLAX PAVILION

Castejón de Monegros has once again hosted the Nowhere Festival, the one-week festival promotes cultural and educational activities focused on the self-expression. The Nomad Folding Flax Pavilion, result of the lightweight Bio Composite seminar, was among the installations presented at the event, developed around the structural value of origami shapes.

2014 - ENDESA WORLD FAB CONDENSER

Pavilion for the FAB10 Symposium (July 2nd to 8th, 2014). Initial design by Margen-Lab, produced by IAAC and collaboratively designed, built, and customized by the Fab Lab Network.

2014 - CATALAN VAULT

IAAC MAA01, in collaboration with Map13 Architects built a Parametrized Catalan Vault, fruit of a 2 week long workshop in Valldaura Labs. Using digital tools along with traditional century old Catalan masonry techniques, with students seeking to re-engineer, compute, and construct a Vault in the forest.
IAAC is also furthered this research investigating in the field of advanced robotic fabrication techniques towards the implementation and autonomation of these complex Catalan vault forms.

1:1
FABRICATION

SPECIAL
PROJECTS

RESEARCH 2014/2017

EXPERIENCE FUTURE CITIES EXHIBITION

IAAC End of Year Exhibition Experience Future Cities, the public event which showcased the best projects of IAAC international researchers. The work displayed had been developed in Institute's Master programmes.

Given the multidisciplinary and multiscale nature of the Master's methodology, the exhibition content ranged from experimentations on new materials to scale-up proposals for new cities, using a variety of materials and supports.

AUTO-MÀTIC EXHIBITION

An exhibition that addresses the limits and potentials of generative drawing, emerging from data through mathematical and mechanical operations; raising questions on automation, reproducibility, and the role of the arbitrary or accidents as sources of creative experimentation.

The research was developed in the framework of Machinic Protocols, a research line directed by Edouard Cabay, in IAAC's Master in Advanced Architecture.

LIVING IN FUTURE CITIES

The exhibition Living in Future Cities is a product of work developed by the international architectural researchers of IAAC. The work examines issues of the near future and proposes a series of solutions in the era of experience, where technology can aid us to positively define the spaces and cities we live, grow and thrive in.

VENICE BIENNALE

The Institute for Advanced Architecture of Catalonia took part in the 15th Venice Biennale, titled "Reporting From the Front" and curated by Alejandro Aravena, with an interactive installation made in collaboration with the Indian architect Anupama Kundoo. Information Technology has opened up new ways of sharing knowledge, moving towards faster and more inexpensive ways, making knowledge more accessible, and making it easier to gather people around common topics of interest.

EXHIBITIONS

Symposium

RESPONSIVE
CITIES

URBANISM IN THE
EXPERIENCE AGE

Some of the brightest minds in the fields of Sociology, Urban Sciences, Technology and Architecture gathered in Barcelona to discuss the Future of our Cities.

The first edition of the Responsive Cities Symposium, chaired by Areti Markopoulou, with programme chairs Chiara Farinea and Mathilde Marengo, established itself as a major event in the architectural debate.

Fifteen outstanding keynote speakers, fifty-four international panellists and more than 400 visitors animated the two-day gathering, held in Barcelona CaixaForum on the 16th and 17th of September 2016 and followed online by more than 700 spectators.

What is the most important challenge for the future Urbanity? What should the role of technology be in the Future City?

Saskia Sassen, Carlo Ratti, Philippe Rahm, Janet Sanz Cid, Areti Markopoulou, Tomás Diez, Albert Cañigueral, Mariina Hallikainen, Lydia Kallipoliti, Maíta Fernández-Armesto, Mar Santamaria, Manuel Gausa, Ethel Barona Pohl and Daniele Quercia were among the international speakers and panellists who met in Barcelona to join the debate about the Urbanism in the Experience Age.

The Symposium was organised by the Institute for Advanced Architecture of Catalonia as one of the main activities carried out under the Knowledge Alliance for Advanced Urbanism – KAAU, the EU co-funded project seeking to promote the innovative education and training that emerging technologies require.

Tomas Diez

Philippe Rahm

Janet Sanz Cid

Mar Santamaria

Symposium

RESPONSIVE

CITIES

ACTIVE PUBLIC
SPACE 2017

The second edition of the Responsive Cities Symposium, chaired by Areti Markopoulou, with programme responsibles Chiara Farinea and Mathilde Marengo.More than a dozen outstanding keynote speakers, 30 international panelists and more than 400 visitors animated the two-day gathering, held in Barcelona CaixaForum and Smart City Expo on the 13th and 14th of November 2017.

On the first day of the symposium the opening of the APS exhibition "Implementing Technology Towards Active Public Space" aimed to promote the knowledge generated in the framework of the Active Public Space Project. At the show, visitors were able to explore best examples of implementation of innovative technologies for public space activation.

How do we design and inhabit our Public Space? How does it perform? What does it produce? These were some of the questions and discussion topics raised during the roundtables and debates taking place at CaixaFòrum and Smart City Expo. Through transversal viewpoints, the 2nd edition of the Responsive Cities Symposium combined disciplines such as urban planning, biology, advanced architecture, interaction, participatory technology and even performing arts to respond to the challenge of how cities can shape their public spaces towards more dynamic, productive and active citizen meeting places.

The Symposium was organised by the Institute for Advanced Architecture of Catalonia as one of the main activities carried out under the Knowledge Alliance for Advanced Urbanism – KAAU, the EU co-funded project seeking to promote the innovative education and training that emerging technologies require.

Mathilde Marengo

Areti Markopoulou

Crimson Rose

FAB CITY
SUMMIT

FAB CITY PROJECT
2018

The Fab City Summit 2018 was an invitation to take part in the global shift towards a more sustainable and accessible future for cities and society. Participants to the summit were invited to experience and learn about how to grow the future of cities. The potential that collaboration and disruptive technologies have to create locally productive and globally connected cities was explored across greater Paris; a fertile territory with many initiatives around circular economy, co-living, urban food production and transformative policy.

The bi-annual summit gathers experts and communities interested in circular economy, urban planning, digital fabrication, new business models, civic engagement and sustainable design and production. Fab Lab Barcelona and IAAC were co-producers of the 2018 two week event at the Parc de la Villette and Hotel de Ville, specifically focused on curating the three-day speaker program which included speakers Saskia Sassen, Dave Hakkens and Mayor of Barcelona Ada Colau.

Conference

MAKER FAIRE

BARCELONA

2018

Maker Faire is a gathering of fascinating, curious people who enjoy learning and who love sharing what they make. From engineers, to artists, to scientists, to crafters, Maker Faire is a meeting place for these "makers" to show experiments, projects and innovations.

We call it the Greatest Show (& Tell) on Earth – a friendly showcase of invention, creativity, and resourcefulness. Glimpse the future and get inspired!

Maker Faire is a hands-on visual feast of invention and creativity and a celebration of technology, arts, craftsmanship, science, and the Do-It-Yourself (DIY) culture. It's for innovative, creative people who like to tinker and love to create, and also for those curious minds who want to see what new and innovative things are just around the corner... and get hands-on!

Maker Faire Barcelona is not just another Maker Faire, or another event in the city, it is the celebration of a new vision for a productive city that a world capital in design, innovation, architecture, urbanism and creativity.

The fifth edition of Maker Faire Barcelona, was an event that aims to bring together Barcelona's creative and innovation communities, and understand them as part of an ecosystem that holds the potential to transform how we will live, work and play in our cities, through the democratisation of technology.

6.9

Lecture Programme

LECTURE
SERIES

Since the year 2000, the Master's in Advanced Architecture runs an international lecture programme in which architects and experts from a variety of different disciplines present their work at IAAC. The lectures are open to the public, making it a high quality cultural activity open to the city of Barcelona.

2014/2018 LECTURERS

Massimiliano Fuksas
Bjarke Ingels
Elizabeth Diller
Bob Sheil
Laura Andreini
Li Xiangning
Izaskun Chinchilla
Oscar Tomico
Mitchell Joachim
Farshid Moussavi
Giovanna Carnevali
Rodolphe el-Khoury
Alberto Diaspro
Alfredo Brillembourg
Hubert Klumpner
Andrew Watts
Jose Luis de Vicente
Dave Pigram
Jelle Feringa
Aaron Betsky
Ali Basbous + Luis Fraguada
Kengo Kuma
Jan Knippers
Yael Reisner
Manuel Jimenez Garcia
Winy Maas
Benhaz Farahi

Lecture Programme

LECTURE
SERIES

INSTITUTE FOR ADVANCED ARCHITECTURE OF CATALONIA

OPEN THESIS FABRICATION

PREVIOUS LECTURERS

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Michel Rojkind
Matthias Kohler
Peter Eisenman
Farshid Moussavi
Bjarke Ingels
Peter Cook
Ricardo Bofill
Ben Van Berkel
Gunter Pauli
Enric Ruiz-Geli
Brett Steele
Pepe Ballesteros
Laura Cantarella
Santiago Cirugeda Parejo
Luca Galofaro
Lourdes García Sogo
Adriaan Geuze
Xaveer de Geyter
Toyo Ito
Francisco Jarauta
Young Joon Kim
Kamiel Klaasse
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Duncan Lewis
Greg Lynn
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Josep Lluís Mateo
Fernando Menis
Alfredo Payá
Jaime Salazar
Max Sanjulián
Charles Renfro
Amadeu Santacana
Mark Wigley
Yung Ho Chang
ILSA & Andreas Ruby
Jacub Szczesny

Jou Min Lin
Lucy Bullivant
Momoyo Kaijima
Manuel Bailo + Rosa Rull
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Angel Borrego
Colectivo Zuloark
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Maria Auxiliadora Galvez
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Mette Ramsgaard Thompsen
David Mocarski
Neil Leach
Richard Blythe
Ben Flanner
Marco Poletto
Anupama Kundoo
Arndt Goldack
George Jeronimidis
Eric Owen Moss
and many others...

MAA 2014-15- Opening Lecture
Winy Maas

MAA 2015-16 CLOSING LECTURE
WOLF D. PRIX

MAA 2015-16- Lecture Series
Alfredo Brillembourg

MAA 2014-15- Lecture Series

MAA 2014-15- Lecture Series
Rodolphe El-Khoury

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To apply: applications@iaac.net