

Iaac

Institute for
advanced
architecture
of Catalonia

BARCELONA

Join the 20th edition
of the world's first
Master in Advanced
Architecture

MASTER IN

ADVANCED

ARCHITECTURE

BARCELONA

Directed by:
Areti Markopoulou



MASTER IN ADVANCED ARCHITECTURE

MAA01 / 09 Months - 75 credits
MAA02 / 18 Months - 130 credits

iaac.net
iaacblog.com

WHAT?

The master in Advanced Architecture is a programme to **revolutionize current architectural** approaches and methods training professionals to become changemakers in the arena of architecture and the built environment.

Based on a **“Learning by Doing”** and a **“Design by Research”** methodology the programme trains professionals capable to critically think out of the box and **materialize novel architectural solutions** for the current and future challenges related to the environment, society and to the linear and homogeneous approach in design and building.

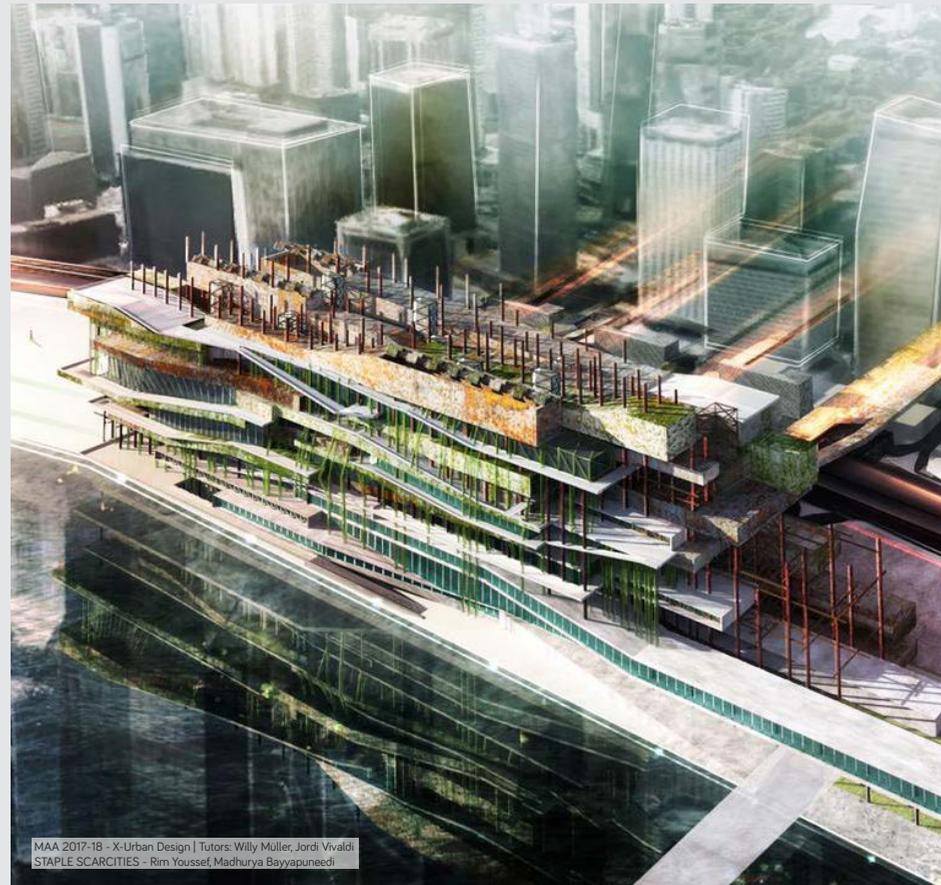
Following a multidisciplinary and multiscalar approach, the programme presents **an academic structure, unique in the world**, where students can create their own customized study agenda according to their interests and their future career aspirations.

WHY?

The digital revolution coupled with the unforeseen environmental, economical and social challenges our world faces today, urge architecture to shake much of the traditions and basis upon which it operated for the last decades, if not centuries. **Design combined with multidisciplinary science** are the two powerful tools for architecture to revolutionarily innovate, and therefore bring a **positive impact and change to the built environment**.

The programme offers a diversity of high-end content in Design Studios ranging from urban scale to buildings, materials and wearable devices.

The seminars and workshops offered by the programme aim to enhance the **technical, computational and digital fabrication skills** of new professionals, able to work in the architectural field, learning from advancements from computer science, advanced manufacturing, synthetic biology, or material science and ecology.



MAA 2017-18 - X-Urban Design | Tutors: Willy Müller, Jordi Vivaldi
STAPLE SCARCITIES - Rim Youssef, Madhurya Bayyapuneedi



WHO?

For architects, designers or engineers that wish to **acquire multidisciplinary skills, practicing radical architecture** that creates positive cultural, environmental and social impact. Are you passionate about **combining design and science to lead the future of the built environment?** Do you want to use algorithms, digital data, digital fabrication machines, or biological and smart materials **for prototyping and accelerating new building innovation solutions?** Then the Master in Advanced Architecture is made for you!

PROFESSIONAL OPPORTUNITIES

The Master in Advanced Architecture methodology connects our students with exceptional international practitioners, industries and institutions that are part of the program's faculty body and part of its collaborative entities. The MAA counts with more than **60 international faculty** and more than **20 collaborative industries** and institutions. At the same time, the program participates in a series of **European funded research projects** giving the students the opportunity to be **professionally integrated into high-end practices** and research entities in the fields of **advanced computational design, digital fabrication, zero emissions architecture or self sufficient and intelligent design**.

Furthermore, the program prepares students for an **entrepreneurial approach to architectural thinking and practice**, thus, with the support of IAAC, students have the possibility to create their own practices in the above mentioned fields.



This programme offers the following different formats:

MASTER IN ADVANCED ARCHITECTURE (MAA01)

Full time - 9 months

The Master in Advanced Architecture is accredited by the School of Professional and Executive Development at the Polytechnic University of Catalonia - European Higher Education Area (EHEA)

Credits: 75 ECTS

Direction: Dr. Areti Markopoulou

Duration : 9 Months
From October 2020 to June 2021 // Full time

Language: English

* Students who enrolled in the Master in Advanced Architecture (MAA01) can also extend their studies joining the OTF - 3D Printing Architecture (MAA01+OTF) or the MAA02.

MASTER IN ADVANCED ARCHITECTURE + THESIS PROJECT (MAA02)

Full time - 18 Months

The Master in Advanced Architecture is accredited by the School of Professional and Executive Development at the Polytechnic University of Catalonia - European Higher Education Area (EHEA)

Credits: 130 ECTS

Direction: Dr. Areti Markopoulou

Duration: 18 Months
From October 2020 to June 2022 // Full time

Language: English

MASTER IN ADVANCED ARCHITECTURE (MAA01+OTF) + POSTGRADUATE IN 3D PRINTING ARCHITECTURE

Full time - 15 Months

The Master in Advanced Architecture + Postgraduate Diploma in Open Thesis Fabrication. Both accredited by the School of Professional and Executive Development at the Polytechnic University of Catalonia - European Higher Education Area (EHEA)

Credits: 75 ECTS + 45 ECTS

Direction: Dr. Areti Markopoulou (MAA) + Alexandre Dubor and Edouard Cabay (OTF)

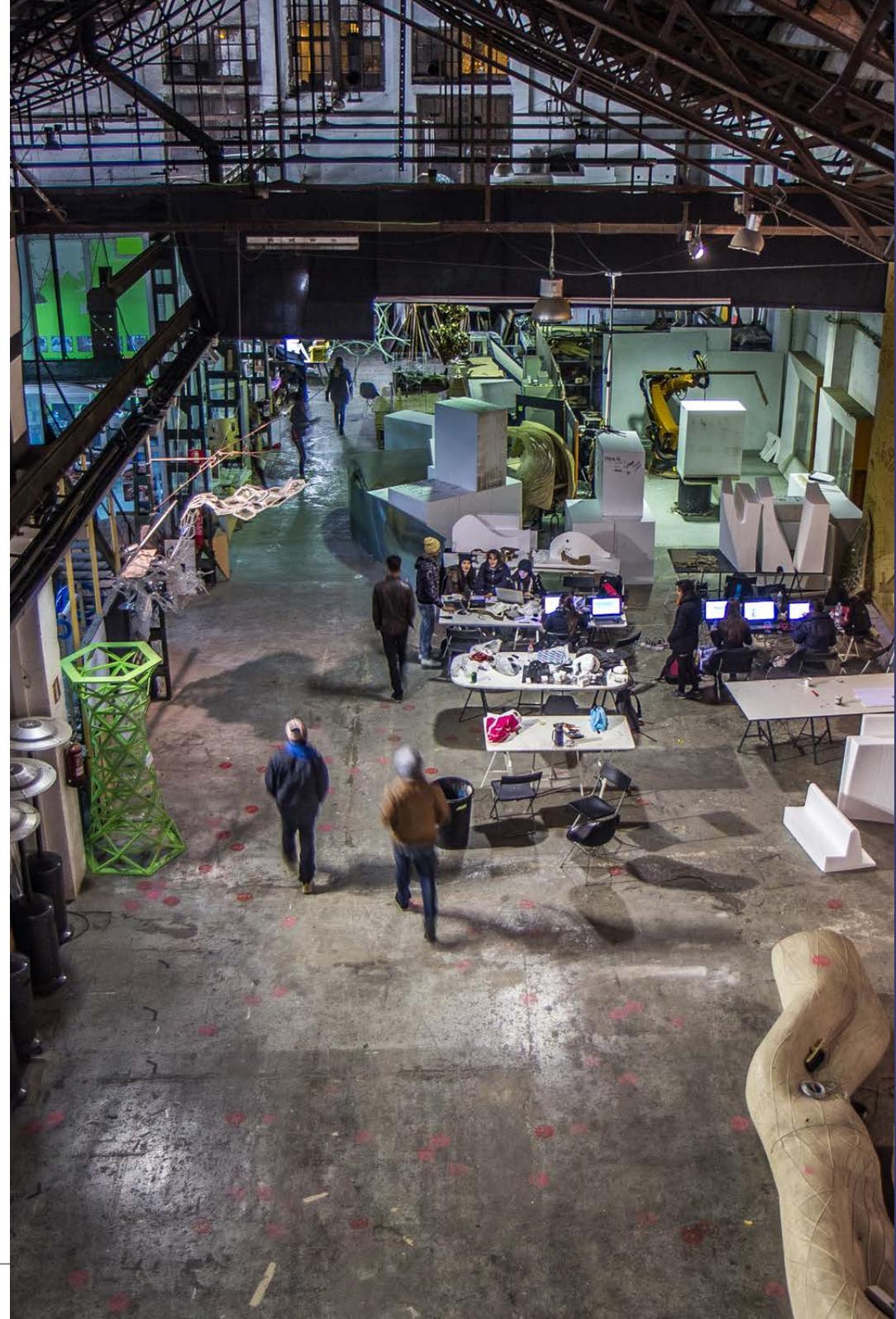
Duration : 15 Months
From October 2020 to February 2022 // Full time

Language: English

The Institute for Advanced Architecture of Catalonia (IAAC) is an international centre for research, education, production and outreach, with the mission of envisioning the future habitat of our society and building it in the present.

Based in Barcelona, the Institute offers multidisciplinary programmes that explore international urban and territorial phenomena, with an emphasis on the opportunities that arise from the emergent technologies, and the cultural, economic and social values that architecture can contribute to today's society.

WELCOME TO THE INSTITUTE FOR ADVANCED ARCHITECTURE OF CATALONIA



IAAC THE INSTITUTE FOR ADVANCED ARCHITECTURE OF CATALONIA

IAAC sets out to take Research and Development 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 Massachusetts Institute of Technology (MIT), Centre for Information Technology and Architecture (CITA), Swinburne University of Technology, Italian Institute of Technology (IIT) as well as diverse companies and offices among which Bjarke Ingels Group (BIG) Barcelona, Hassell Studio, Cloud 9, McNeel Europe, Foster and Partners, Bofill Architects (RBTA), Studio

Fuksas, KUKA Robotics, Heatherwick Studio, and many others.

In collaboration with these entities, the Institute develops various research programmes that bring together experts in different disciplines such as **architecture, engineering, biology, sociology, anthropology and other fields of investigation.**

IAAC has made a name for itself as a centre of international reference, welcoming students and researchers from **over 60 different countries.**



IAAC IS EDUCATION

With a wide range of pioneering master programmes, giving the next generation of architects and changemakers the space to imagine, test and shape the future of cities, architecture and technology.



IAAC IS HERITAGE

With the Vallldaura Labs, a self-sufficient research centre located in the Collserola Metropolitan park, 20 minutes from the centre of Barcelona and surrounded by 140 hectares of forest, where a series of laboratories are implemented for the production and testing of Energy, Food and Things.



IAAC IS RESEARCH

Thanks to a series of projects with industry as well as projects funded by the European Union and developed in collaboration with public and private European partners, oriented to explore the role of technology in our society and cities.



IAAC IS COMMUNITY

Beyond its educational and pro-research work, seeks permanent contact and cooperation among the hundreds of faculty, researchers, institutions and companies that have worked with us or that pursue the objective of providing solutions to the great challenges of humanity.



IAAC IS OUTREACH

Through lectures, publications, exhibitions and competitions. Thanks to initiatives such as the IAAC Lecture Series, the Advanced Architecture Contest or the Responsive Cities Symposium, IAAC promotes its values in the discussion about architecture, cities, society and technology, facing the nowadays worldwide challenges.



IAAC IS INNOVATION

With the Fab Lab Barcelona, the first and most advanced digital production laboratory in EU, and the Green Fab Lab, the first digital fabrication laboratory oriented to self-sufficiency: two places where you can build almost anything.

Fab Lab Barcelona has consolidated its role within the Fab Lab Network as one of the worldwide leaders of the Digital Fabrication Revolution as well as the Coordinator of the Fab Academy Programme.

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IAAC is located in the Poblenou neighbourhood of Barcelona, in the recently created district known as 22@, an international reference for companies and institutions oriented toward the knowledge society. In the 22@, cutting-edge firms, universities, research and training centres are integrated with different agents of promotion that facilitate interaction and communication among them.

The neighbourhood is close to the historic centre and the seafront, and features some of the most iconic landmarks of the city such as the Agbar Tower and the Design Hub building. The ongoing projects of the Plaça de les Glòries and the Sagrera APT station are also making it one of the most dynamic enclaves in the city.



PUJADES CAMPUS

IAAC is housed in two old factory buildings, with 4,000 m² of space for research, production and dissemination of architecture.

The space itself is a declaration of principles, embodying an experimental and productive approach to architecture.

The IAAC Pujades Campus premises include the Fab Lab Barcelona, an architecture and design-oriented digital fabrication laboratory, and a second Fabrication Laboratory, entirely dedicated to the development of IAAC students projects.



VALLDAURA CAMPUS

Valldaura Labs is IAAC's second campus located in the Collserola Park, the green heart of Barcelona's Metropolitan Area.

The campus is a 140 hectares 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 series of laboratories that work to set a new benchmark for self-sufficiency.

The Valldaura Labs premises include the Green Fab Lab, a fabrication laboratory oriented towards self-sufficient and productive solutions. The Food Lab and the Energy Lab, allowing students to research the specifics of the production of key elements involved in self-sufficiency.



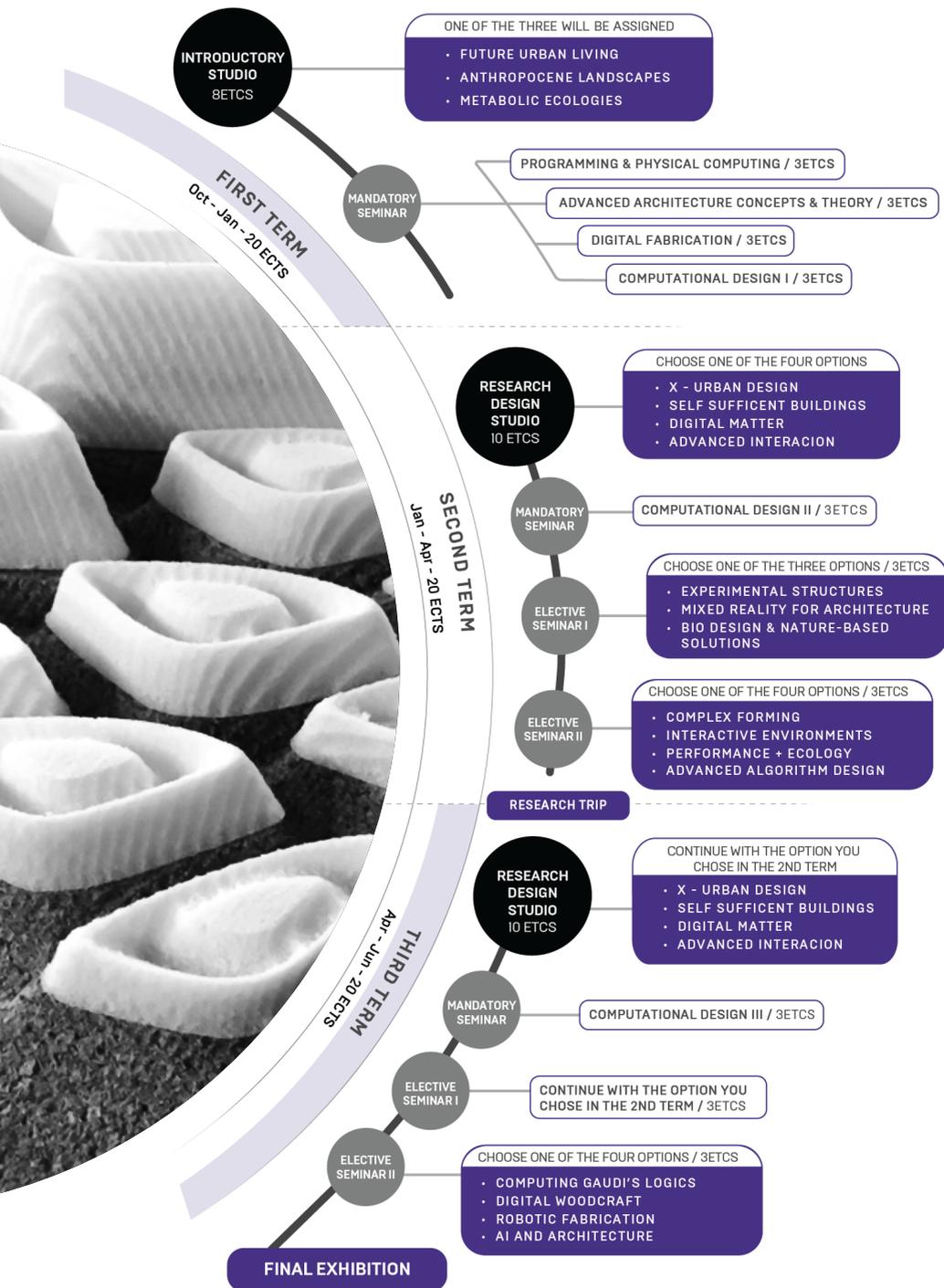
MASTER IN ADVANCED ARCHITECTURE (MAA01)

ACADEMIC STRUCTURE

SEMINARS & WORKSHOPS

Within the current global context of rapid change, integrated with the potentials of digital technologies, IAAC's Master in Advanced Architecture (MAA) is committed to the generation of new ideas and applications for Urban Design, Self Sufficiency, Digital Manufacturing Techniques and Advanced Interaction.

In this context IAAC works with a multidisciplinary approach, facing the challenges posed by our environment and the future development of cities, architecture and buildings, through a virtuous combination of technology, biology, computational design, digital and robotic fabrication, pushing innovation beyond the boundaries of a more traditional architectural approach.



FIRST TERM

Duration: 3 months - from October to December

The 10-week introductory term provides a common grounding of knowledge and skills to incoming MAA students. It is a formative platform structured with an Introductory Design Studio aiming to offer the necessary skills for the ideation, development and application of novel research projects.

Additionally, there are four complementary seminars focusing on enhancing intellectual and technical skills in critical thinking, parametric design, digital fabrication and physical computing.

The first term serves as a base, anticipating challenges and ideas that will appear during the programme, in relation to self sufficiency, design complexity, innovative forms of planning and contemporary culture. A toolbox of both theoretical and practical skills for further research work.

SECOND TERM

Duration: 3 months - from January to March

The second term format is an Open Educational Structure where students can customise their curriculum, according to their specific academic interests and future career aspirations, choosing:

- one out of four Research Studios,
- one out of three two-term seminars,
- one out of four one-term seminars.

Additionally, all students follow one mandatory seminar in computational design in order to continue developing their parametric design skills.

THIRD TERM

Duration: 3 months - from April to June

The third term is structured similarly as the second term. During the term, students continue with their chosen Research Studio, as well as the two-term seminar. Additionally, they choose one out of four one-term seminars, which offer diverse skills with respect to those in the second term.

Also in this term, all students follow one mandatory seminar in computational design in order to continue developing their parametric design skills.

FINAL PROJECT

Duration: 1 month - June

The fourth phase focuses on the necessary production of final drawings, prototypes and audiovisual material for the completion of the Development Studio Project of Term 3 (13 ECTS credits). During this period, students are developing the final prototypes, as well as a final written document, related to the Research and Development Studio that have been developed in the previous two terms.

NOTE: The above calendar refers to the Master in Advanced Architecture 2019-2020 edition. Calendar of 2020-2021 may be subject to slight variations.

First Term

INTRODUCTORY STUDIO

Lead by:
Carmelo Zapulla, Sebastian Amorelli, Marco Poletto, Claudia Pasquero, Javier Peña and Oriol Carrasco

Following a learning by doing methodology, the Introductory Studio gives students the opportunity to fully explore and apply the various tools and techniques assimilated during their 1st term at IAAC. From the examination of space, understood as layers of activities and their interaction, to the design and simulation of behaviors, animated through performative models; or the profound understanding of mechanisms of local energy, food and bio-material production in dense urban environments, contributing to the urban morphogenesis of contemporary cities; all developed with the support of digital fabrication and parametric design.



SEMINARS & WORKSHOPS
 TERM 1

COMPUTATIONAL DESIGN

In computer science, algorithms are habitually defined as fixed and often finite procedures of step-by-step instructions understood to produce something other than themselves. These logic structures interface with data, sourced from any computable phenomena, becoming the basis for a new array of design strategies. The Computational Design Seminar focuses on emergent design strategies based on algorithmic design logics. From the physical spaces of our built environment to the networked spaces of digital culture, algorithmic and computational strategies are reshaping not only design strategies, but the entire perception of Architecture and its boundaries.

ADVANCED ARCHITECTURE CONCEPTS & THEORY

Based on the term "Advanced Architecture", coined in 2003 in the Metapolis Dictionary of Advanced Architecture, this course aims to establish some theoretical principles around 3 Conceptual Perspectives:
 [1] Transversal Logics: information - cities
 [2] Relational Logics: cities - nature
 [3] Digital Logics: nature - information.

The seminar explores relevant architectural references, in order to construct a critical body of knowledge that serves as a basis (both theoretical and practical), in particular related to the emergent paradigm around advanced architecture.

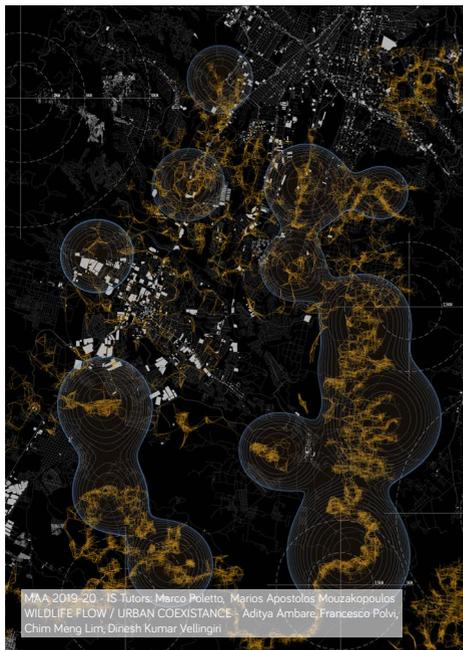
DIGITAL FABRICATION

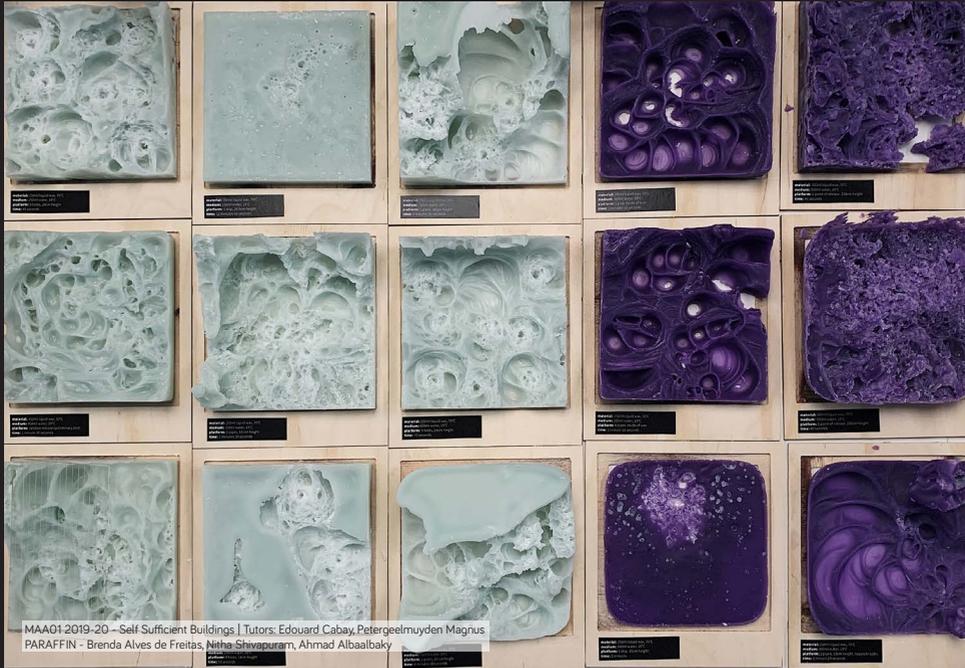
The Digital Fabrication seminar explores different scales of production for architecture, using Digital and Robotic Fabrication techniques such as: CNC cutting (laser) & milling, 3D printing, molding, casting, as well as composite design and fabrication. One of the goals is to introduce thinking around production as a workflow, by following the evolution of the design through process iterations.

PROGRAMMING AND PHYSICAL COMPUTING

The Programming and Physical Computing Seminar provides students with an essential introduction to the world of open-source programming languages and physical computing, in order to create a synchronous and meaningful interaction between the physical and digital realms.

After gaining the necessary hardware and software knowledge, students are able to integrate interfaces, visualizing methods, data sensing, and actuation, to conduct more advanced research and architectural proposals with embedded technology.





MAA01 2019-20 – Self Sufficient Buildings | Tutors: Edouard Cabay, Petergeelmuyden Magnus
 PARAFFIN - Brenda Alves de Freitas, Niha Shivapuram, Ahmad Albaalbaky

Second & Third Term

RESEARCH STUDIOS



MAA 2019-20 – Digital Matter | Tutors: Areti Markopoulou, David Andres Leon, Raimund Krenmüller
 INGENO: Olivia Alvarez, Anton Koshelev, Ivan Marchuk



MAA 2019-20 – Digital Matter | Tutors: Areti Markopoulou, David Andres Leon, Raimund Krenmüller, Nikol Kirova
 STUDIO KICK OFF WORKSHOP



MAA 2014-15 - Intelligent Cities | Tutors: Willy Müller, Jordi Vivaldi, Piera, Starsky Lara
CYBECO - Jonathan Irawan



MAA 2018-19 - The House of the Future | Tutors: Carmelo Zappulla, Sebastian Amorelli
LITTLE AMSTERDAM - Axel van der Veste, Ricardo Lichtle, Karisma Bhagnani, Sofia Madeira, Hareesh Ragunathan



MAA 2017-19 - X-Urban Design | Tutors: Willy Müller, Jordi Vivaldi
WATERLAND - Luciana Teodozio, Elena Kavtaradze



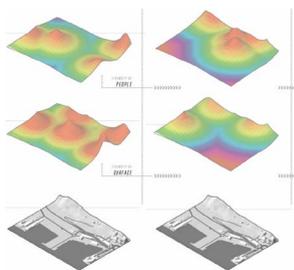
MAA 2014-15 - Self Sufficient Buildings | Tutors: Enric Ruiz-Geli, Mireia Luzarraga
FARMASEED - Anh Vu, James Mitchell, Joel Kahn

X-URBAN DESIGN

Lead by:
Willy Müller

X-Urban Design Studio works beyond the conventional scales of territorial design, town planning, building or fabrication in designing a multi-scalar habitat. As in the design of ecosystems, each level has its own rules of interaction and relation, and at the same time must comply with certain parameters that pertain to the system as a whole. The Studio focuses on projects that range in scale from the territory to the neighborhood.

The idea of X-Urban Design is related to two issues: on one hand, the understanding of countries and cities around the world with emerging economies and cultures that, by virtue of their regional or economic position, can contribute value to the planet as a whole. In this sense the studio seeks to identify the particular urban and territorial values of these places in order to construct more intelligent territories anywhere in the world, moving on from the western idea that there is a single model of city (be it European or from the United States) to work on the basis of more complex and more open values. The other issue related to X-Urban Design has to do with their creation as intelligent territories that function in a multiscale way, emphasizing the relationship between nature, networks and nodes and promoting the 'emergence' of an urban intelligence through research on the application of ICT (Information and Communication Technologies) in different aspects of the urban infrastructure and public space.



SELF-SUFFICIENT BUILDINGS

Lead by:
Edouard Cabay
Petergeelmuyden Magnus

Self-sufficiency is about consuming the resources you are able to produce, annulling our ecological footprint. This scenario is close to the statements that we need to achieve for the 2020 agenda. During the Research Studio self-sufficiency will be a wider concept, not only we will apply this term when speaking about energy, but also speaking about other issues like water, food, economy and society among others.

As architects, our role in this new concept of ecology goes beyond buildings, materials, light, space or shape. Our approach to this new way of thinking must be holistic, emphasizing the importance of the whole, and the interdependence of its parts. Therefore, for us, architecture is about this complex combination of elements and their relations. We will read and learn from the people that are already talking about this holistic way of thinking (Rifkin, Braughart, Mc Donnough, Latour...).

In order to face this approach to thinking, architects cannot be alone, they must learn to work inside multidisciplinary teams. A starting point will be the scenario of the studio, in which we will work on our projects together with physicists, biologists, economists and designers. Inside the topic of self-sufficiency, in the past years IAAC has developed projects around the ideas of Factory of the Future, Urban Retrofitting, Factory of Knowledge, and many more.





2014-15 MAA Digital Matter
HYDROMEMBRANE: Luisa Roth



2016-17 MAA Digital Matter
[SLIME MOULD] LIVING SCREENS: Catalina Puella, Fabio Rivera, Johana Monroy



2014-15 MAA Digital Matter
REMEMBRANCE: Ji Won Jun, Josep Alcover, Matteo Silvano



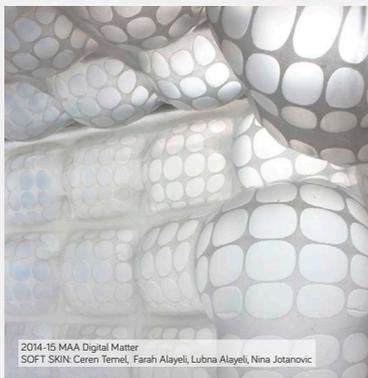
2018-19 MAA Advanced Interaction | Tutors: Luis Fraguada, Elisabeth Bigger
DAYDREAMERS: Kamill, Steven Carranza



2017-18 LLUM Festival | Tutors: Luis Fraguada, Cristian Rizzuti
PLAYBALL: MAI students



2014-15 MAA Digital Matter
REMEMBRANCE: Ji Won Jun, Josep Alcover, Matteo Silvano



2014-15 MAA Digital Matter
SOFT SKIN: Ceren Ternel, Farah Alayeli, Lubna Alayeli, Nina Jotanovic



2014-15 MAA Digital Matter
SOFT SKIN: Ceren Ternel, Farah Alayeli, Lubna Alayeli, Nina Jotanovic



2018-19 LLUM Festival | Tutors: Luis Fraguada, Cristian Rizzuti
BOSC NOCTURN: MAI and MAA02 students



2016-17 MAA New Interfaces Seminar | Tutor: Luis Fraguada
TOPOGRAPHY OF SOCIAL TOUCHING: Lina Salamanca, Lalin Keyvan

DIGITAL MATTER

Lead by:
Dr. Areti Markopoulou
David Andres León

Today, we are facing a change in paradigm in the field of Architecture. Information Era Technologies and their impacts on architecture are drastically changing, and their relationship calls for new or adapted concepts, where physical space seamlessly intertwines with digital content, and where the language of electronic connections tie in with that of physical connections.

We are consequently moving towards a different form of "habitats", where architecture is not merely inhabited, but becomes technologically integrated, interactive and evolutionary. If computers were once the size of buildings, buildings are now becoming computers, both in a performative sense, on I/O Communication protocols, and in a programmable sense, at material molecule nanoscale; even becoming operational thanks to self-learning genetic algorithms.

The key, thus, to 21st century challenges generated by global urbanization, economic instability and particularly the increasing awareness related to the environmental crisis will be the development of high efficient "products" with increasing levels of functionality. Architecture following every stage of life will have to address and respond to both challenges and advancements. Our buildings and cities will need new interfaces to communicate with the environment and embedded systems of performance that do not rely on existing urban infrastructures. Active and bio-materials will play a critical role in this development, forcing architects to get free from mechanical actuators or computing devices and integrate into their designs the inherited functions that "smart materials" present on a molecular scale.



ADVANCED INTERACTION

Lead by:
Luis Fraguada and
Elisabeth Bigger



Today we communicate and interact with smart devices, physical and virtual environments, the Internet of Things. User-generated content mixes with professional contributions. In our Age of Participation, mostly driven by social media and gaming but also by interactive arts and performances, passive recipients turn into active participants, becoming creative players.

Interactive environments go beyond the passive reception by creating an immersive, communicative and social experience. All fields of study and practice require the skills to make meaningful use of available and forthcoming technologies. This is mainly due to the increased adoption of technology in our daily lives. Data and Information now encompass a sort of Metadata Layer, which crosses all aspects of our existence. The Advanced Interaction Research Studio is dealing with the core technologies across merging disciplines of all creative expressions, which will form future means of interacting. Creating dialogues between the natural environment and new digital frontiers. It questions the limits of these contemporary technological phenomena and prepares candidates to be the key actors capable of making connections between disciplines where none were possible or even considered before. The programme will empower you to create the interfaces for connecting all kinds of data and understand how to transform it into meaningful social and emotional communication.

SEMINARS & WORKSHOPS

TERM 2 & 3

EXPERIMENTAL STRUCTURES

Experimental Structures focuses on performative data informed structures for extreme contexts. Being a two-term seminar, it links structural design and fabrication techniques, by means of feedback between digital and physical.

While using structural engineering plugins for Rhino and Grasshopper, students gain knowledge on how to design based on concepts and typologies of structural optimisation. This culminates in off-site construction methodologies, testing 1:1 connections or/and assembly methods.

INTERACTIVE ENVIRONMENTS

We are surrounded by natural forces in complex and wonderful ways. We spend our lives interacting with and understanding our environment. Interactive Environments focuses on researching and exploring the motion produced by natural forces such as water, wind or gravity, and playing with them to create digital and physical installations, with the help of physical computing and programming, where these forces become the lead actors for interaction within the framework of architecture.

BIO DESIGN & NATURE BASED SOLUTIONS

Living systems have the potential to provide cities with multiple ecosystem services, such as food, materials, energy production, climate control, water purification, or pollination. How can digital technologies help us integrate living systems into urban environments? Can we build the future of cities through a nature-based approach?

Students generate new visions and applications for the future of our cities, using computation and digital manufacturing to develop projects, and 1:1 scale functioning prototypes of urban elements, integrating living systems into the urban environment.

ROBOTIC FABRICATION

This seminar explores a series of methodologies, that incorporate advanced design thinking, generative algorithms and mass customized fabrication in existing industrial processes. This development is accompanied with novel interfaces for robotic programming and large-scale automated construction.

MIXED REALITY FOR ARCHITECTURE

Today, Artificial Realities are emerging through devices, such as Hololens, which are enabling new ways to transmit, quantify, redefine, share or access new ways of communication and visualized information.

Mixed Reality for Architecture introduces the current trends, exploring their main capabilities in software and hardware development. Students get in touch with the basics of coding in c# and java, and learn the necessary knowledge for developing AR/MR applications within the Unity development platform.

COMPLEX FORMING

Complex Forming studies lightweight, low-mass and self supporting convoluted structures, linking computational design and algorithmic methods, with advanced manufacturing protocols and assembly processes. It explores the development of digital tectonics into structures that unify envelope, structure, form, and experience into a unique system.

COMPUTING GAUDI'S LOGICS

Learning from the unfinished Colònia Güell chapel (1898-1914), Antoni Gaudí wanted the structure for the Sagrada Família Basilica (1882 - ongoing) to be 'equilibrated', and calculated accordingly. By equilibrated we mean that the gravity forces for the whole basilica are directed axially through the columns: each column is therefore aligned to meet these forces as efficiently as possible through their axes.

The seminar investigates two challenges: the description and representation of columns, and the creation of a potentially underlying geometrical guide, and to branch columns and join them elegantly to the trunk. Students develop both design computation through parametric design software, and physical outputs materialising the production of branching columns with their hands.

PERFORMANCE & ECOLOGY

Affairs such as the beginning of Anthropocene or Climate Change are changing our vision towards Nature. Here we concentrate attention on a "natural" location that is going through an environmental collapse due to a multiplicity of factors, most of them caused by human actions.

Starting with the first stage, students reveal all the agents and relationships that have taken this place to ecological disaster to then design a device that is capable of interacting with that environment, contributing to creating a healthier and a more balanced ecosystem.

AI IN ARCHITECTURE

Digital tools have changed architectural design strategies over the last decades. Artificial intelligence today empowers them with adaptability, awareness and autonomy, fostering interaction and responsiveness in architecture.

AI in Architecture explores novel computational design strategies, training students in the development of self-learning and evolutionary design processes in architecture.

ADVANCED ALGORITHMIC DESIGN

Advanced algorithmic design explores the dual geometrical/topological computing nature of spatial systems, from basic iterative logics explored through Grasshopper and the Anemone plug-in, to more sophisticated network-based and topology-based stigmergic strategies, using both standard and bespoke components.

This seminar focuses on assembly/growth processes, investigated through iterative algorithmic strategies, and applied to an urban-block size architecture starting from elementary spatial building blocks.

DIGITAL WOODCRAFT

The seminar focuses on the unique merge of digitalisation, material performance and craft.

Through processes of material manipulation, Digital Woodcraft explores the possibilities of (robotic) fabrication of wood structures. The aim is to analyse and materialize the potential of wood-work within a framework of computation and fabrication towards sustainable design solutions.

A woman with dark curly hair, wearing a light blue blazer, is shown in profile from the waist up, looking towards a large, textured wall sculpture. The sculpture is made of white, layered, curved elements that create a complex, organic pattern. The lighting is dramatic, with strong shadows and highlights, emphasizing the three-dimensional quality of the wall art.

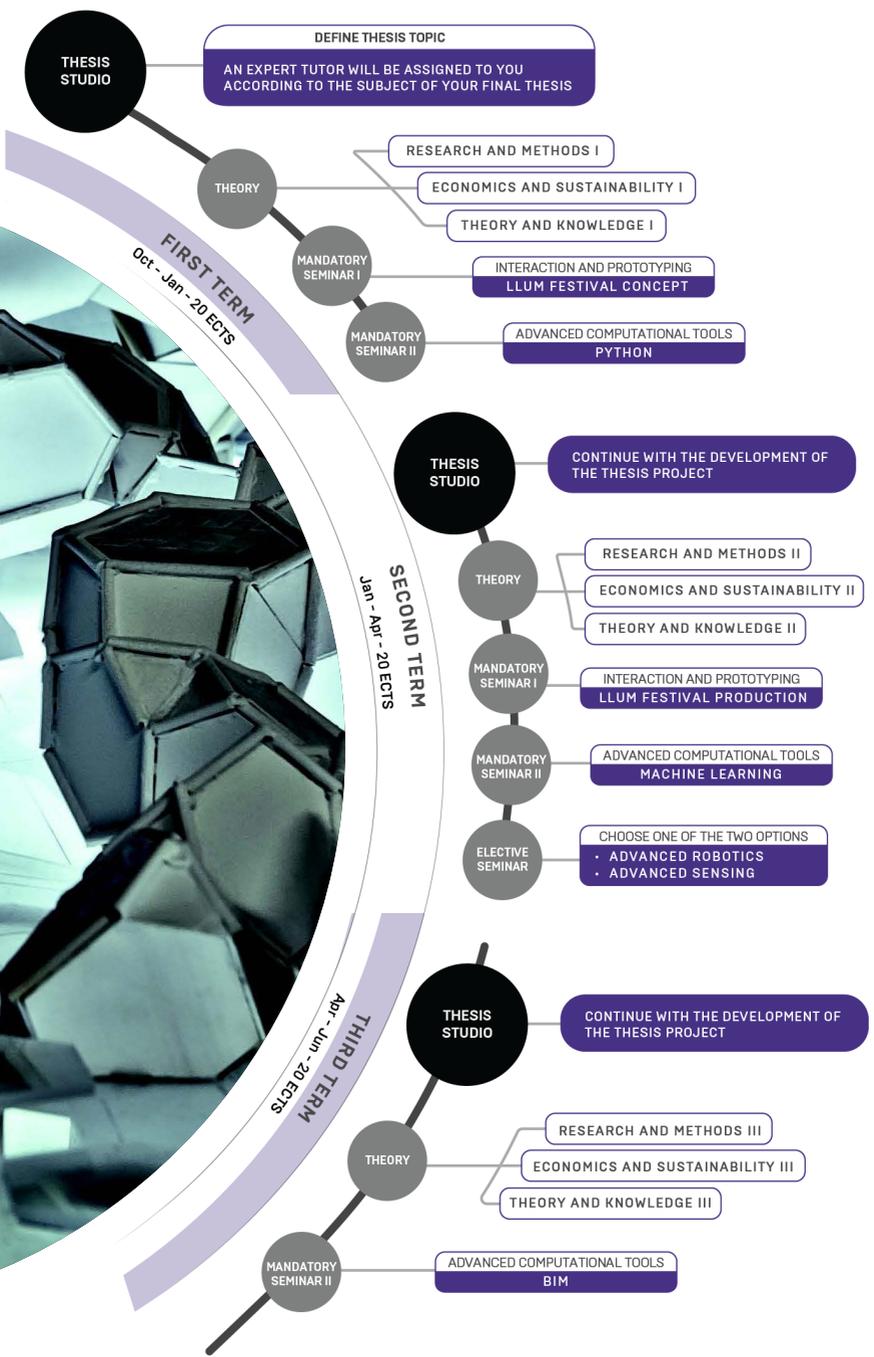
MASTER IN ADVANCED ARCHITECTURE + *THESIS PROJECT*

ACADEMIC STRUCTURE

SEMINARS & WORKSHOPS

During the second year of the Master in Advanced Architecture, students have the opportunity of working hand in hand with a series of renowned experts in various fields, to develop an in-depth individual research agenda. Students propose a thesis project, to be developed throughout the year, and are allocated with an Individual Thesis Advisor who specialized in relation to the topic proposed.

MAA02 is a developmental platform structured by means of a research Design Project, and three complementary courses, anticipating ideas that will emerge during the programme in relation to the research proposals of the thesis themes, design strategies, innovative forms of planning and contemporary culture, supporting theoretical research, as well as the practical development of the thesis projects. On top of this, the MAA02 students have the opportunity to work alongside the IAAC team in the development of a series of 1:1 scale projects and prototypes to be deployed throughout the city of Barcelona.



The second year of the MAA is centred around the development of an Individual Thesis Project, which will be supervised by a Thesis Advisor. In order to support the thesis project development and strengthen the professional and academic profile, students have the opportunity to follow several seminars and workshops. These courses will explore new topics or will broaden student's knowledge in the fields of Theory and methods, Advanced Computational and Fabrication tools, Interaction and Prototyping.

FIRST TERM

Duration: 3 months - from October to December

During the first phase of the second year, students start the initial steps of their Individual Thesis project's research development, including research contextualisation, analysis, as well as first design iterations and prototypes. Additionally, the first term has four complementary courses, focused on research methodology, theory, economics and sustainability, advanced computation and fabrication tools. All classes in this term are mandatory.

SECOND TERM

Duration: 3 months - from January to March

This period dives into *research through design and learning by doing* principles and actuation, where students go deeper into scientific exploration and further prototyping for their Individual Thesis. Within this term, students continue with the methodological, theoretical, computational and fabrication seminars in a close relationship to their research. All classes in this term are mandatory.

THIRD TERM

Duration: 3 months - from April to June

This term is structured around the development of the final design proposals, drawings and prototypes related to a student's thesis project. Furthermore, students work on systemic design principles that could extrapolate the logic of their projects in a variety of contexts, scales and case studies. The final presentation and defence of the master thesis, takes place before a jury panel in the month of June. All classes in this term are mandatory.

MASTER THESIS BOOK

July to September

This phase (summer period) does not include presential classes, and is dedicated to the development of the complete written document/book of the Individual Thesis Project. The final submission includes 2 printed copies of the book and can also include the publication of a scientific paper.

NOTE: The above calendar refers to the Master in Advanced Architecture 2019-2020 edition. Calendar of 2020-2021 may be subject to slight variations.

MAA-02

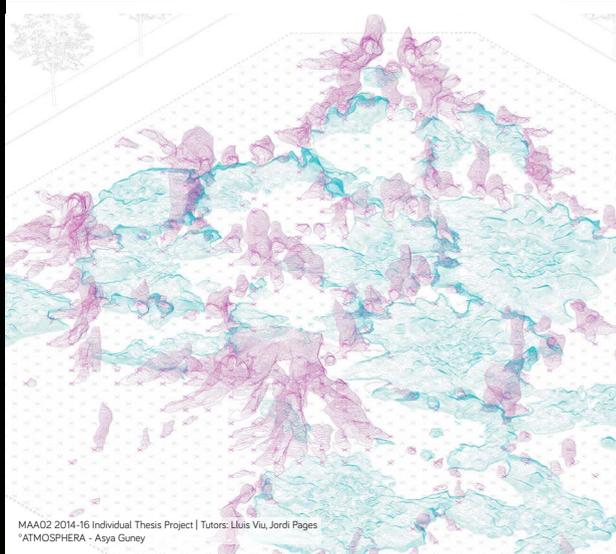
MASTER THESIS PROJECT



MAA02 2015-17 Individual Thesis Project | Tutor: Marcos Cruz
SOFT CERAMIC - Christopher Wong



MAA02 2014-16 - Individual Thesis Project | Tutors: Marcos Cruz
INSAND/OUT - Kunaljit Chadha



MAA02 2014-16 Individual Thesis Project | Tutors: Lluís Viu, Jordi Pages
*ATMOSPHERA - Aya Gurney



MAA02 2017-19 Individual Thesis Project | Tutor: Marcos Cruz
ADAPTIVE SENESEENCE - Elliott Santos

NOVEL MATERIALS, BIOLOGY & ARCHITECTURE

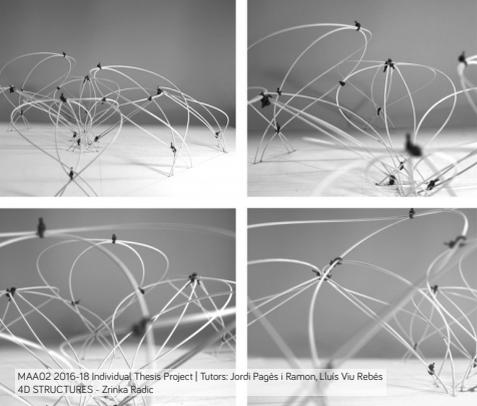
Thesis Advisors, including:
DR. MARCOS CRUZ
DR. ARETI MARKOPOULOU
KUNALJIT CHADHA
DR. NURIA CONDE PUEYO

This topic of Thesis Projects focuses on developing new bio and environmentally integrated designs strategies. Students explore advanced computational models and simulations that are applied to building prototypes made of new material composites that are either bio-inspired or bio-integrated. Many of the proposed objects and components aim to stimulate natural growth of biological organisms and the integration of these species in buildings. In a time in which more people are living in cities, the ultimate aim of the Thesis projects in this topic is to develop a radically new sensibility of understanding of architecture where climate and nature, as well as new sense of materiality is the driving motif for design.

ADVANCED ALGORITHMS & ARCHITECTURE

Thesis Advisors, including:
DAVID ANDRES LEON
DR. ALESSIO ERIOLI
RODRIGO AGUIRRE
ALDO SOLLAZZO

This topic of Thesis Projects focuses on developing advanced computation and algorithmic design for the creation of artificially intelligent architecture. Students work with the collection and process of vast amounts of data in order to create predictive models that could enhance architectural design, which in its turn could emerge as an organism showcasing autonomous behavior. The thesis projects developed in this topic create advanced computational processes that could be applied in both design and construction of architectural process as well as during the performance of the built space and environment. Parametric design as well as artificial intelligence and machine learning processes are explored as tools to enhance architectural behavior and performance.



MAA02 2016-18 Individual Thesis Project | Tutors: Jordi Pagés i Ramon, Lluís Viu Rebés
4D STRUCTURES - Zrinka Radic



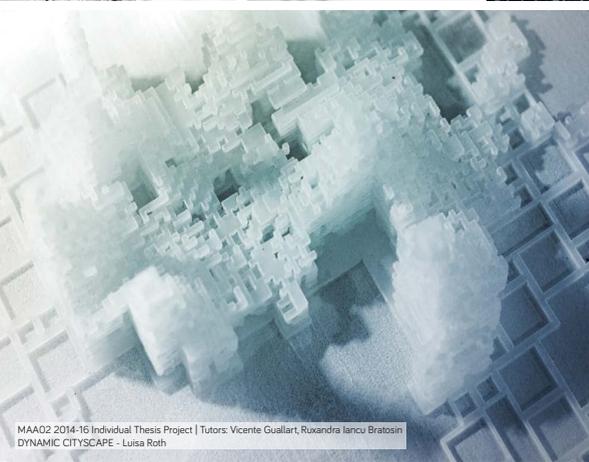
MAA02 2014-16 Individual Thesis Project | Tutors: Vicente Guallart, Ruxandra Iancu Bratosin
DYNAMIC CITYSCAPE - Luisa Roth



MAA 2014-15 Self Sufficient Buildings | Tutors: Enric Ruiz Geli, ...
RESURRECTURE - Shruti Ramchandran, Alessia Tosetto, Maja Czesnik



MAA 2017-19 Introductory Studio | Tutor: Javier Peña, Oriol Carrasco
URBAN MUTATIONS - Sheha Vveik, Taras Kashko, Frank Feng



MAA02 2014-16 Individual Thesis Project | Tutors: Vicente Guallart, Ruxandra Iancu Bratosin
DYNAMIC CITYSCAPE - Luisa Roth



MAA02 2014-16 Individual Thesis Project | Tutors: Jordi Pagés i Ramon, Lluís Viu Rebés
REDEFINING JOINERY: SURFACE EXPANDED JOINERY SYSTEM IN SHELL STRUCTURE - Hsin Li



MAA 2017-18 Self Sufficient Buildings | Tutors: Enric Ruiz Geli, Mireia Luzzaraga
SEED SPAWN - Ozge Tektas



MAA02 2016-18 Individual Thesis Project | Tutor: Vicente Guallart
PLUG&DISPLAY - Cristina Pardo

ADVANCED MANUFACTURING & ARCHITECTURE

Thesis Advisors, including:
ALEXANDRE DUBOR
RAIMUND KRENMÜELLER
EDOUARD CABAY

This topic of Thesis Projects focuses on developing and applying advanced manufacturing technologies in the architectural construction. Robotic Fabrication, additive manufacturing (3d printing) or feedback loops among material performance and construction machines are the main topics students work on for the development of their thesis. Taking into consideration that the construction sector has been a slow sector integrating technological innovation, the Thesis projects developed in this topic merge expertise from industry and manufacturing with creative design processes and computation.

METABOLIC DESIGN & ARCHITECTURE

Thesis Advisors, including:
DR. MATHILDE MARENGO
WILLY MÜLLER
DR. CHIARA FARINEA
DR. DIEGO PAJARITO

With buildings being responsible for 40% of energy consumption, 36% of CO2 emissions, and the building industry being one of the heaviest waste generators globally, it is indispensable for architecture to respond, moving away from the current prevailing models-both intensely resources-consuming and contaminating. This topic of Thesis Projects focuses on developing design strategies and solutions based on "non-linear" and circular systems aiming to close or limit material and resource loss, while minimizing waste, using this as a resource in itself. Students work on applications and implications of circular economy for the creation of new urban and building metabolisms which are productive and regenerating.

BUILDING PHYSICS, ECOLOGY & ARCHITECTURE

Thesis Advisors, including:
ENRIC RUIZ GELI
DR. JOSEP PERELLO
JAVIER PEÑA
DR. MANUEL GAUSA

Global warming is a priority goal in all of our agendas and it is starting to change way of living. We measure global warming with particles, and we might have to fight global warming with particles too. Science, technology and the techniques to alter nature and our bodies both physical and social, have become indispensable to face this new scenario. This topic of Thesis Projects focuses on developing ecological solutions to restore nature and environment through the understanding of building physics. Students research and simulate atmospheric and environmental data in order to create new architectural operations that could revert environmental change through a positive impact. Buildings physics and the study impact on earth and society are used in order to visualize information and propose design and strategic actions for the built environment.

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SEMINARS & WORKSHOPS

RESEARCH AND METHODS

The Research & Methods course is a platform oriented to the development of specific scientific skills, acquired through practice, in-line with the learning by doing methodology applied at IAAC, allowing the students to critical thinking and research competencies, to be applied in a personal and independent way to their specific research agenda.

This includes all phases of the research, from designing the thesis itself, the program of study, to practical information on localizing sources and databases, defining key research objectives, selecting a methodology, designing and developing experiments, determining a related and selected bibliography, and compiling the thesis delivery in itself, all focused on understanding and prioritizing information.

ECONOMICS AND SUSTAINABILITY

Urban and architectural design often lack an in-depth acknowledgment of both macroeconomic and microeconomic variables. Lost in translation, both disciplines are doomed to contribute to marked trends of unsustainable production and consumption.

This seminar provides an opportunity for the students to look at their Individual Thesis from a completely different perspective. It provides the knowledge and understanding of the role of economic analysis and economic incentives in assessing the outcomes of their projects and in shaping the environment in which architectural and design decisions are made.

Moreover, the seminar encourages students to start considering sustainability and resilience, and factor in economic elements to their design development.

THEORY AND KNOWLEDGE

The last few decades have confirmed the evidence of a spectacular change of paradigms in the definition of our spaces of relation, interaction and sociability. These transformations have to do with the current and accelerated growth of the technological capacity to process information, increase communication and multiply the differential definitions of our environment(s).

The seminar investigates theoretical frameworks of this change of paradigms associated with a new Advanced Knowledge. It is based on a multidisciplinary approach to different key notions that are crucial in order to understand the potentials of Advanced Architecture from a theoretical point of view. Taking a critical approach to key-words such as "matter", "aesthetics", "city", "nature" as a base, the seminar constructs a cross-linked thinking, related with the complex processing of information, and its evolutionary and dynamic projection.

Additionally, during the two-term seminar, students have an opportunity to learn how to produce a reflection of one particular aspect of their thesis project in the format of an academic paper.

INTERACTION AND PROTOTYPING

One and a half term Seminar explores the possibilities of Visual programming and physical computing, finally applying those in a project - a fully developed interactive installation of an innovative and pioneering installation for Barcelona's Light Festival LLUM.

Moreover, during the seminar students gain experience in dealing with real scale project logistics, taking care of the budget, searching for sponsors hips and facing regulations of an ephemeral installation's building process.

MACHINE LEARNING

The Seminar introduces students to a range of machine learning methods, such as neural networks, clustering, auto-encoders and Q-learning. These tools are taught as a series of exercises, which gradually unveil the greater picture of machine learning as a design tool for a potential application within the development of the individual thesis projects.

PYTHON FOR GRASSHOPPER

Python extends Grasshopper's functionality, allowing students to create custom scripts and perform more complex workflows. The Seminar introduces the Python programming language to the students allowing them to deepen their Individual Thesis' computational side.

ADVANCED SENSING WORKSHOP

Interactive elements have more commonly found expressions in contemporary architecture. Further, integration of interaction into the Architecture in order to modulate daylight, shading and/or ventilation have taken the climate responsive design to the next level. Applications of kinetic façades allow the building envelope to adapt and interact with human and environmental conditions. This workshop looks at an expanding overlap between interactive design, architecture and media arts, to explore how the ideas and methods of interactive design can be applied in larger environments and spaces.

ADVANCED ROBOTICS WORKSHOP

The workshop deals with implementation of real time feedback from a six electro-mechanically driven axes robot through industrial communication protocols. During the workshop, students learn how to establish a relation between the robot and its environment using Online control. Through the workshop, students develop a virtual environment placing the robot in the center to interact with the virtual objects to produce physical data. The trajectory of the robot is decided through a sequential interface incorporating the virtual entities to generate live results.

BIM

Building Information Management for architectural and building design (BIM) is rapidly becoming a highly requested tool to join architects, clients, builders and engineers in a single intelligent and shared process. Students learn how to combine BIM softwares with parametric design processes, strengthening their design and management skills.

MASTER IN ADVANCED ARCHITECTURE FACULTY



Directed by:
DR. ARETI MARKOPOULOU

Areti Markopoulou is a Greek architect, researcher and urban technologist working at the intersection between architecture and digital technologies. She is the Academic Director at IAAC in Barcelona, where she also leads the Advanced Architecture Group, a multidisciplinary research group exploring how design and science can positively impact and transform the present and future of our built spaces, the way we live and interact. Her research and practice seek to redefine architecture as a performative “body” beyond traditional notions of static materiality, approximate data, or standardized manufacturing.

Head of Studies: **DR. MATHILDE MARENGO**

Academic & MAA02 Coordinator: **MARCO INGRASSIA**

MAA01 Coordinator: **GABRIELE JUREVICIUTE**

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DR. ARETI MARKOPOULOU
 Advanced Materials & Building Performance

DR. MATHILDE MARENGO
 Research Methodology & Urban Design

WILLY MÜLLER
 Urban Design

EDOUARD CABAY
 Self Sufficient Buildings

LUIS FRAGUADA
 Advanced Interaction

DR. MANUEL GAUSA
 Advanced Architecture Concepts

JAVIER PEÑA
 Metabolic Architecture

ORIOL CARRASCO
 Metabolic Architecture

DR. MARCO POLETTO
 Dynamic Ecologies

DR. CLAUDIA PASQUERO
 Dynamic Ecologies

DR. CARMELO ZAPULLA
 Future Housing

DR. MARCOS CRUZ
 Biomaterials in Architecture

ENRIC RUIZ GELI
 Building Physics and Ecology

DR. ALESSIO ERIOLI
 Advanced Algorithmic Design

ANDREA GRAZIANO
 Advanced Algorithmic Design

MARK BURRY
 Applied Computation & Fabrication

DAVID ANDRES LEON
 Digital Matter & Algorithmic Design

ALEXANDRE DUBOR
 Additive Manufacturing & Robotics

ALDO SOLAZZO
 Computational Design & Robotics

MANJA VAN DE WORP
 Experimental Structures

DR. GONZALO DELACÁMARA
 Economics of Sustainability

RODRIGO AGUIRRE
 Computational Design

RAIMUND KRENMÜLLER
 Digital Fabrication & Robotics

KUNALJIT CHADHA
 Robotic Fabrication

DR. JORDI VIVALDI
 Advanced Architecture Concepts

DR. JOSEP PERELLÓ
 Physics & Simulation

DR. GIOVANNI PEROTTO
 Advanced Materials

DR. CHIARA FARINEA
 Nature Based Solutions & Ecology

CRISTIAN RIZZUTI
 Interactive Design

JOSÉ STARSK NAYA LARA
 Mixed Reality in Architecture

MATEUSZ ZWIERZYCKI
 Artificial Intelligence in Architecture

PABLO ROS
 Advanced Interaction

DR. NURIA CONDE PUEYO
 Synthetic and Computational Biology

DR. DIEGO PAJARITO
 Data Science & Cartography

ELIZABETH BIGGER
 Advanced Interaction

EUGENIO BETTUCCHI
 Computational Design

MASTER IN ADVANCED ARCHITECTURE FACULTY

EDUARDO CHAMORRO

Digital Fabrication

MIREIA LUZÁRRAGA

Performance & Ecology

DR. PAOLO BOMBELLI

Bio Design

TOM SVILANS

Digital Wood Craft

PETER GEELMUYDEN MAGNUS

Computational Design

NIKOL KIROVA

Novel Material & Fabrication

ALESSANDRO ZOMPARELLI

Complex Forms & Simulation

MOHAMAD ATAB

Bio Design & Fabrication

ASHKAN FOROUGH DEHNAVI

Computational Design

RICARDO MAYOR

Digital Fabrication

LANA AWAD

Digital Fabrication

APOSTOLOS MARIOS MOUZAKOPOULOS

Computational Design

SEBASTIAN AMORELLI

Computational Design



PREVIOUS PROJECTS

RESEARCH BY DESIGN

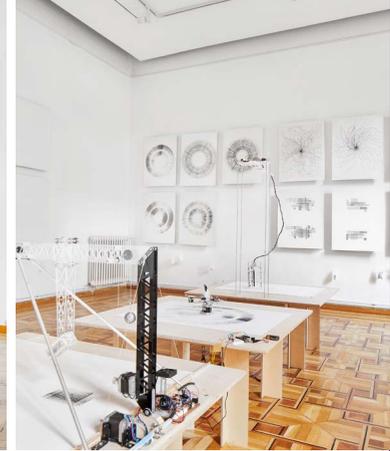


Photo Credits: Filippo Poli

DESIGNING AND BUILDING COMPLEX GEOMETRIES

IaaC, in collaboration with Map13 Architects and BLOCK Research Group, ETH Zurich, finalized the Parametrized Catalan Vault, fruit of a 2 week-long workshop where a team of 27 Students designed and constructed a thin-tile vault in our forest campus in Valldaura. Advanced digital tools along with traditional century-old Catalan masonry techniques have been deployed in the process, with students seeking to re-engineer, compute, and eventually construct a Vault in the forest.

BOVEDA 2014



AUTOMATED DRAWING & MAPPING

SCRIPTS – A CHRONICLE OF INCIDENTS 2017

The exhibition *Scripts – a chronicle of incidents*, directed by Edouard Cabay and hosted at La Casa Elizalde in Barcelona, displays an extensive series of drawings produced without the hand, emerged by the relentless gesture of a mechanical device, alimeted by an external source of information. Structured in three different sections, it features automated plotting machines, data-driven cartographic drawings and performing architectural models. The exhibition raises the questions of the replicability of an artistic artefact and the role of chance in creative experimentations. The moment in which the machine seems to lose the traditional precision that normally features, it is when the most powerful results are produced.

The exhibition presents the 2016 work of Machinic Protocols, a Master in Advanced Architecture Introductory Studio led by Edouard Cabay and Rodrigo Aguirre.



Photo Credits: José Hevia and Xavier González



Photo Credits: Kathleen Bainbridge

**NATURAL MATERIALS
EXPERIMENTATION
FOR EPHEMERAL
ARCHITECTURE**

NOMAD | FOLDING
FLAX PAVILION
2017

The Nomad Folding Flax Pavilion, result of the Lightweight Bio Composite Seminar, was among the installations presented at the event. The pavilion, developed around the structural value of origami shapes, can be moved and constructed with ease.

The seminar, a collaboration with the technological center EURECAT and the wood industry partner GURIT, has explored the agency and new potential of natural materials, developing a digitally manufactured bio-composite for lightweight construction.



**FABRICATING
INTERACTIVE
INSTALLATIONS**

BOSC NOCTURN
2019

Bosc Nocturn (en. Light Forest) is an interactive installation, which invites people to enjoy the play of light. While combining both audition and vision, visitors can interact and change the light movement by their input through the microphones.

Installation consisted of 6000 LEDs, which were spread throughout the site to create an illusion of a forest in 22@ district, and 4 microphones, which were placed near each window overlooking the "forest". By talking, shouting or singing to the microphones, visitors were encouraged to interact and contribute to the play of light landscape. The installation catered to all age groups as well as the physically challenged people.

The project, designed and developed by the students of the MAA second year, has been presented in the LLUM 19, the Festival of Light of the city of Barcelona.

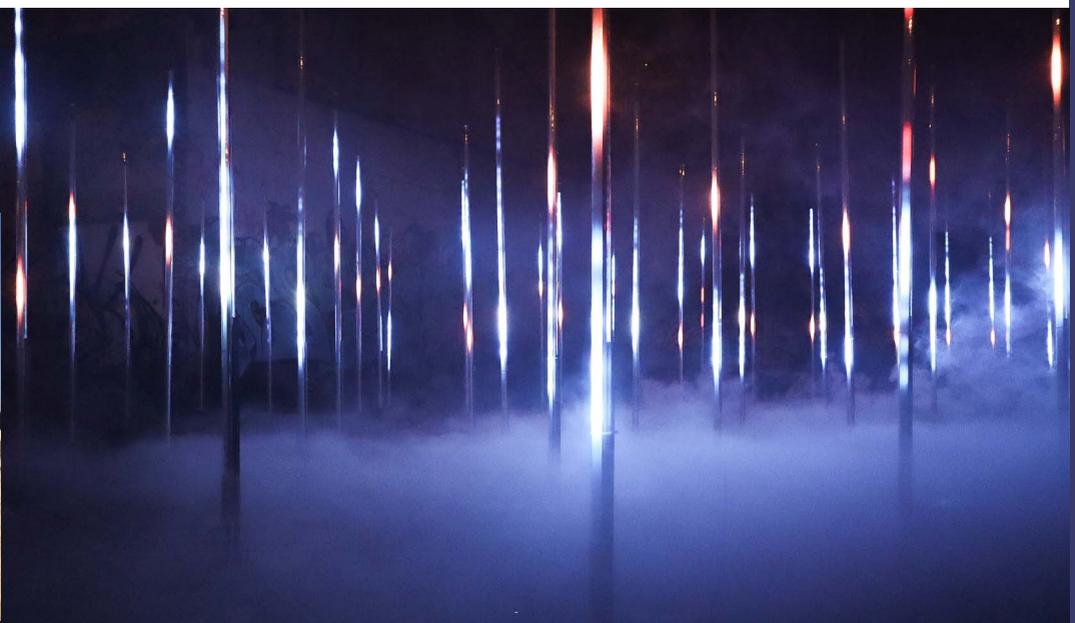


Photo Credits: Gabriele Jureviciute



SWINBURNE UNIVERSITY OF TECHNOLOGY

Swinburne University of Technology is a public research university based in Melbourne, Australia. It focuses on the development of career-ready graduates in business, health, science, design, technology and innovation, with a broad field of expertise and first rate facilities. IAAC is an off-shore PhD partner of Swinburne.

CITA

CENTRE FOR INFORMATION TECHNOLOGY AND ARCHITECTURE (CITA)

CITA [Centre for IT and Architecture] is a research centre at the Royal Danish Academy of Fine Arts, Schools of Architecture, Design and Conservation. CITA examines how new information and communication technologies fundamentally challenges architectural practice as a tool for design, fabrication and communication.

HASSELL

HASSELL STUDIO

Hassell Studio is a leading international design practice with studios in Australia, China, South East Asia, the United Kingdom and the United States of America. With a multidisciplinary team of architects, interior designers, landscape architects, urban designers, planners and specialist consultants, Hassell Studio focus their main attention on people and how to create better, more meaningful experiences for them. Studio does that through creative, holistic thinking, a deep knowledge base and a rigorous design process.



CLOUD 9

Based in Barcelona, Cloud 9 works at the interface between architecture and art, digital processes and technological material development. Their multifaceted projects include stage designs and buildings, installations and patents, and are realized together with collaborative partners. While looking at pilot Projects in Global Warming Scenarios, Cloud 9, led by Enric Ruiz Geli uses new technological developments for digital fabrication and the performative character of architecture, which creates intelligent structures in emulation of nature.



MCNEEL EUROPE

Founded in 1980, McNeel is a privately-held, employee-owned company with development, sales support, and training offices and affiliates all around the world. McNeel's mission is to enrich its clients, employees, suppliers, community, and stockholders - in that order. Started by replacing drafting tables with productive AutoCAD systems, McNeel is currently focused on using AutoCAD drawings and related data in all business processes, including design, planning, marketing and maintenance as well as developing, publishing, and supporting specialty software for designers, engineers, and fabricators, and their related support staff.

KUKA

KUKA ROBOTICS

KUKA AG is an internationally active company with sales of around 3.5 billion euro. Every day, roughly 14,200 KUKA employees at their headquarters in Augsburg and around the world work to ensure that they remain one of the world's leading suppliers of intelligent automation solutions. Their international customers come from, among other sectors, the automotive industry and general industry. KUKA offers you everything from a single source: from the individual components to fully automated systems.

Other entities include: City Council of Barcelona, IIT Smart Materials Group, Bofill Architects (RBTA), External Reference Architecture Bureau, Foster and Partners, Studio Fuksas, Heatherwick Studio, Miralles Tagliabue EMBT, Ecologic Studio, Bjarke Ingels Group (BIG) Barcelona, MaterFAD, Leitat Technological Center, Eurecat - Technology Centre of Catalonia and many others.

MAA

COLLABORATIVE ENTITIES

