



—http://

Metabolic Architecture Studio

Rhinoceros + Grasshopper + Ladybug

Computational Design Workshop.

<http://competitions.uni.xyz>

Abstract

Metabolic Architecture studio is an intensive design program that focuses on designing a design process by means of algorithms. The course is based on understanding the process of building a shape by means of digital sculpting, translating a standard 3D modelling process into grasshopper vocabulary and then automating it to interpolate infinite design iterations as solutions driven by variables while documenting design problems for further use. The studio also involves understanding the relation between design - analysis - fabrication, and to synthesize a workflow that combines these three cornerstones of an architectural workflow.

The course is carefully crafted for beginners and advanced users of computational tools alike. It doesn't matter if you are someone who has no prior knowledge of visual programming or scripting and want to start from the scratch. Alternatively, if you're already somewhat experienced, and you want to know methods to enhance your computational workflows, we also cover advanced techniques to script complex algorithms and automate design solutions.

What is Computational Design and Why is it a good fit for you?

Computational design is the application of computational tools and strategies to the design process. Traditional design process relies on intuition and experience to solve design problems, computational design on the other hand aims to enhance that process by encoding design decisions using a computer language. The design approach thus relies on designing the process rather than the final product.

Computational design is most commonly implemented by using a coupling of a 3d Modelling environment and a visual programming interface. Although traditional text-based scripting is preferred for more control and possibilities, visual programming software such as Grasshopper and Dynamo is considered more user friendly and intuitive.

Computational design is also seen as an iterative design approach, and thus balances excellently within the domain of analysis-design-fabrication. Thus you would often find a computational designer often implementing digital fabrication in their design workflow.

What will you learn in this design studio?

Apart from providing the basic and advanced skill training in digital sculpting with Rhinoceros 6, visual programming with Grasshopper and Environment analysis with Ladybug, the course will upgrade your design skills to be able to design with algorithms to solve complex design problems. The course will create a major boost in your design output from concept to details.

The course will also expose you to Avant-garde design practices, techniques and workflows which you can easily incorporate in your existing design workflow. The course seeks to propagate the digital, computational, process-driven design strategies which will certainly prove to be a game changer in your career.

Why is it Important to know Computational Design?

In the forever evolving design industry, technology can be considered as the currency. It can't be further stressed how important an advanced tool can be in the forever increasing design demands, challenges and competition.

With the looming pressure of upcoming AI intervention into design, understanding and application of Computational Design becomes essential. Moreover, these tools are now quite mainstream and can be an important in any scale or stage of design, to save time, energy and money.

PREMISE
(Overview) | Specifics

OUTCOME

STRUCTURE

TIMELINE

INSTRUCTOR

CHALLENGE

What all tools you are going to learn!

Rhinoceros 6 is a NURBS modelling software that relies on surface geometries to realize complex shapes. It is a versatile software that is widely used by Architects, Industrial Designers, Design Engineers, Jewellery Designers and Graphic Designers. It has a great backward compatibility in terms of its UI, but at the same time its stupendously advanced for an intuitive design tool.

Grasshopper is a visual programming software and scripting environment embedded inside Rhino 6. Unlike scripting languages, Grasshopper requires no knowledge of programming or scripting or syntax rules, but still allows designers to build form generators from the simple to the awe-inspiring. The user interface is highly intuitive and quite practical when it comes to translating design into a process.

Ladybug is an environment analysis and visualization plugin for Grasshopper. It allows you to import and analyse standard weather data in Grasshopper; draw diagrams like Sun-path, wind-rose, radiation-rose, etc; customize the diagrams in several ways; run radiation analysis, shadow studies, and view analysis.

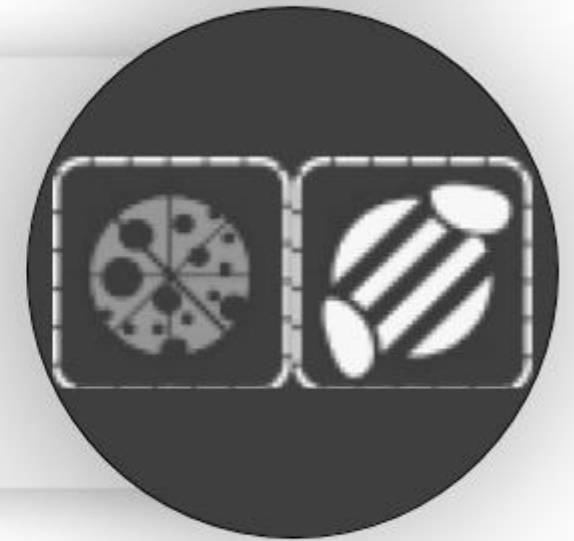
Digital Sculpting with **Rhinoceros 6**



Algorithmic Design with **Grasshopper**



Environmental Analysis with **Ladybug**



PREMISE

Overview | (Specifics)

OUTCOME

STRUCTURE

TIMELINE

INSTRUCTOR

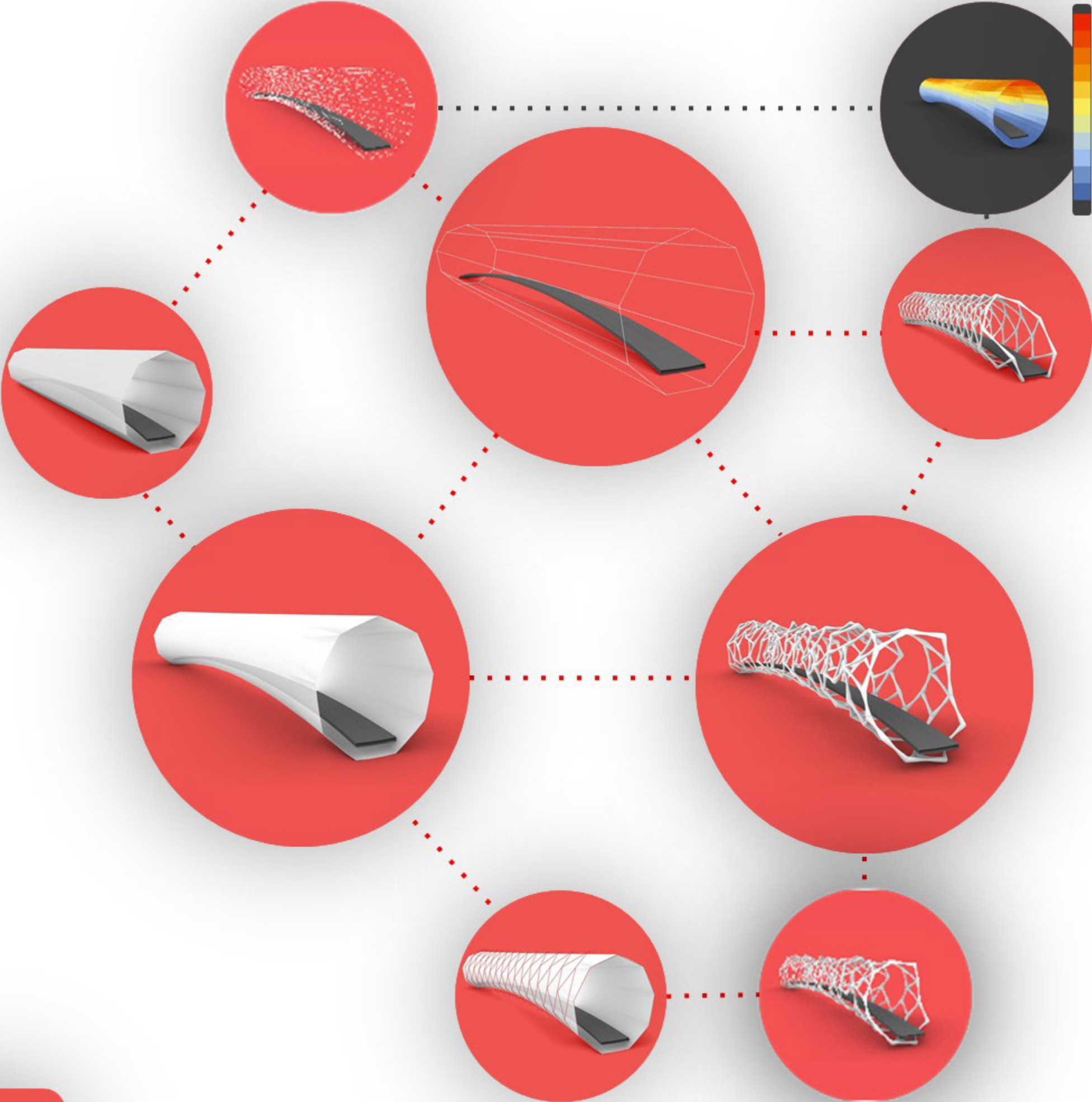
CHALLENGE

Why to take this Design Course?

This webinar course is a well researched step by step understanding of a 3d modeling software that is wide, intuitive and advanced . Rhinoceros, Grasshopper and Ladybug tools have a plethora of tutorials, tips, tricks and hacks available online, but this is the Computational Design Masterclass you always wanted.

With the entire course completely integrated within a Design curriculum, **Metabolic Architectures Studio** focuses on the understanding and implementation of Computational Design strategies. The Studio has a thoroughly documented process that has been tested in International Architectural Schools and Design Studios. At the end of the studio, the participants would not just feel confident applying computational design strategies in their workflow, but will experience an opening of new domains and applications of their design instincts.

Participants will find the non linear workflow to be more fluid and bottom up approach as compared to the traditional design techniques.



OUTCOME

(Generic) | Take-Away

PREMISE

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Takeaways from the Design course

Software Tools:

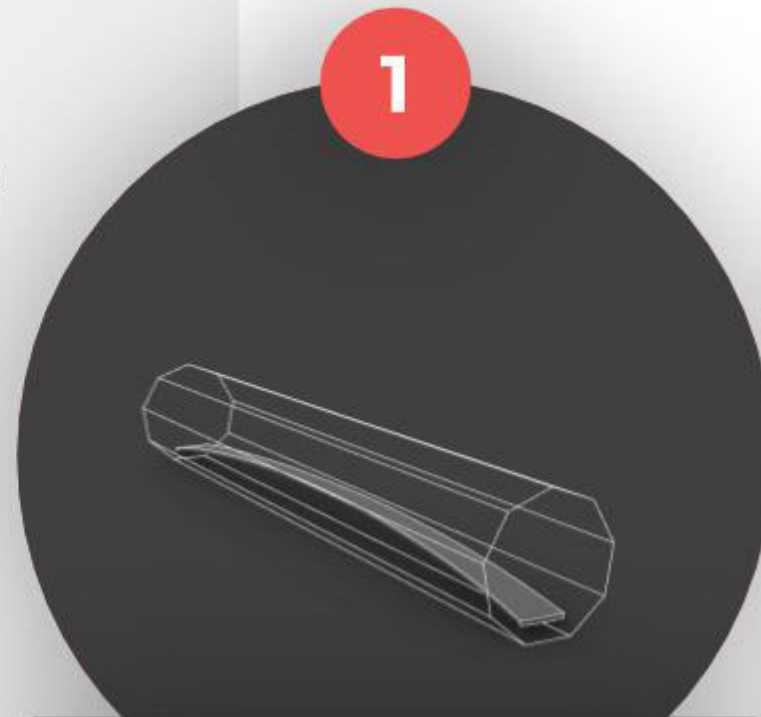
1. Rhinoceros – Digital Modeling
2. Grasshopper – Algorithmic Design
3. Ladybug – Environment Analysis

Bonus Tools:

1. Kangaroo (Physics Simulation)
2. Elk (GIS tools)
3. Lunchbox (Paneling tools)
4. Weaverbird (Mesh tools)
5. Anemone (Looping algorithms)
6. Pufferfish (transformation tools)
7. Wombat (Extra Grasshopper tools)
8. Heteroptera (Grasshopper utilities)

Design Studio:

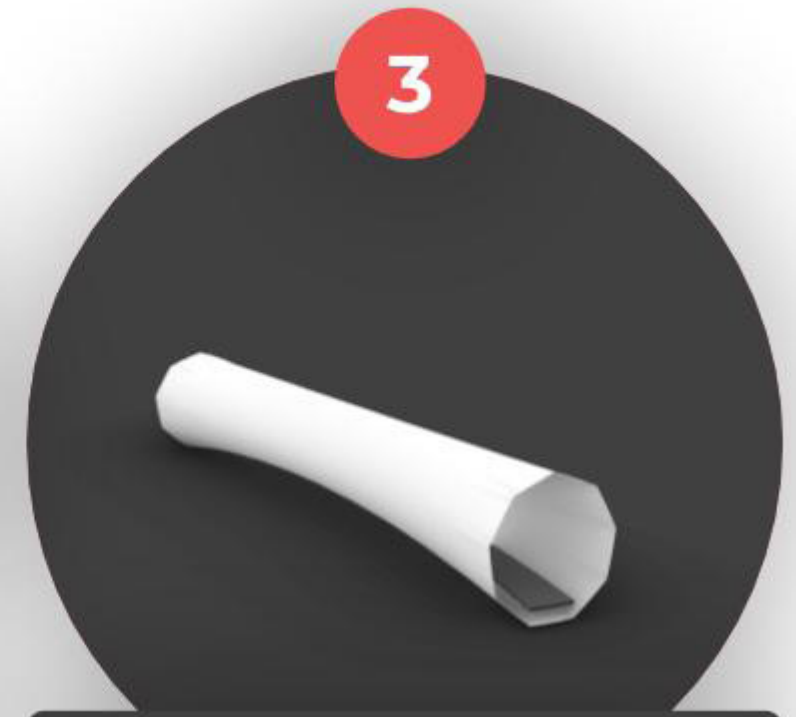
1. Metabolic Architecture
2. Anabolic design techniques
3. Catabolic design techniques
4. Computational design strategies
5. Nonlinear design workflow
6. Design with data
7. Algorithm aided design
8. Introduction to digital fabrication
9. Introduction to machine learning



DIGITAL MODELING



DIGITAL SCULPTING



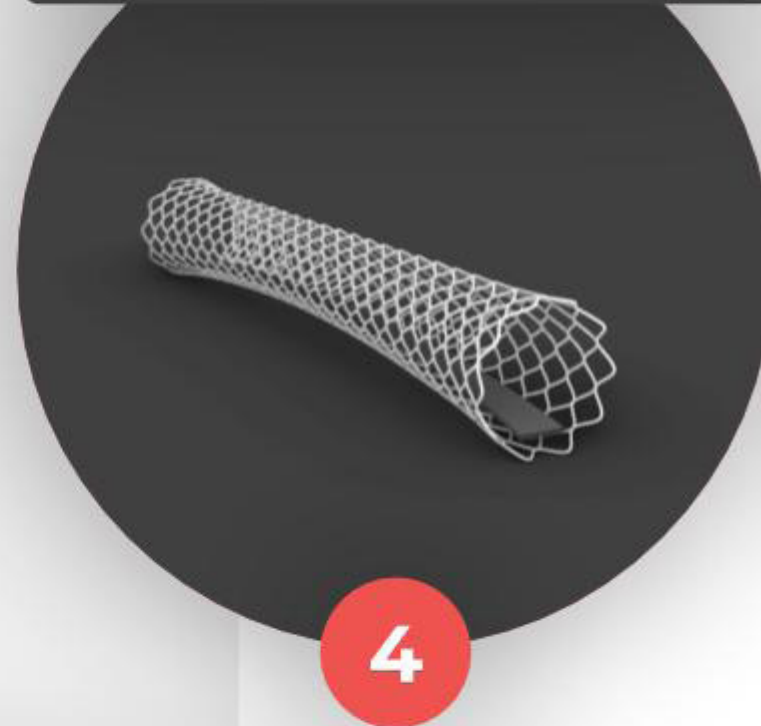
VISUAL PROGRAMMING



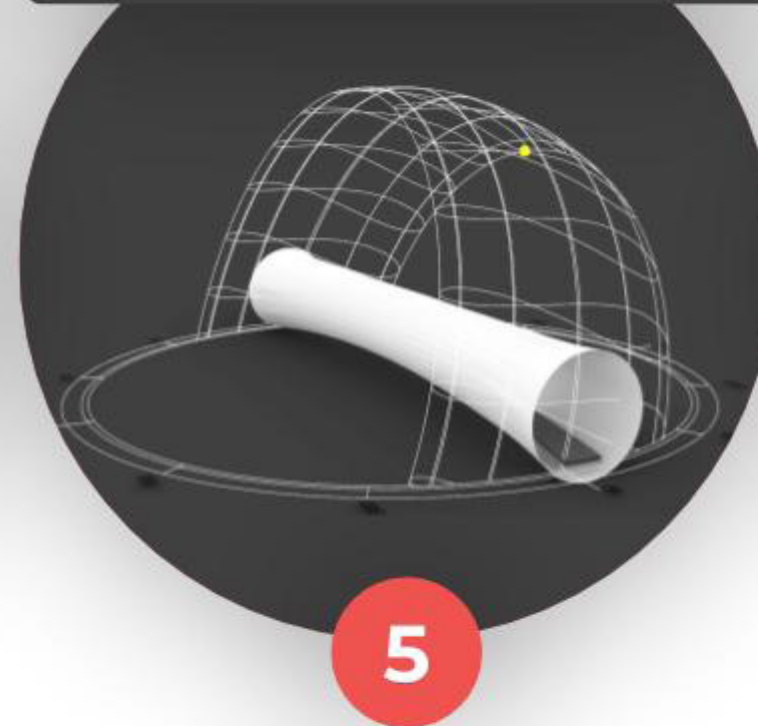
ALGORITHMIC DESIGN



CONTEXT MODELING



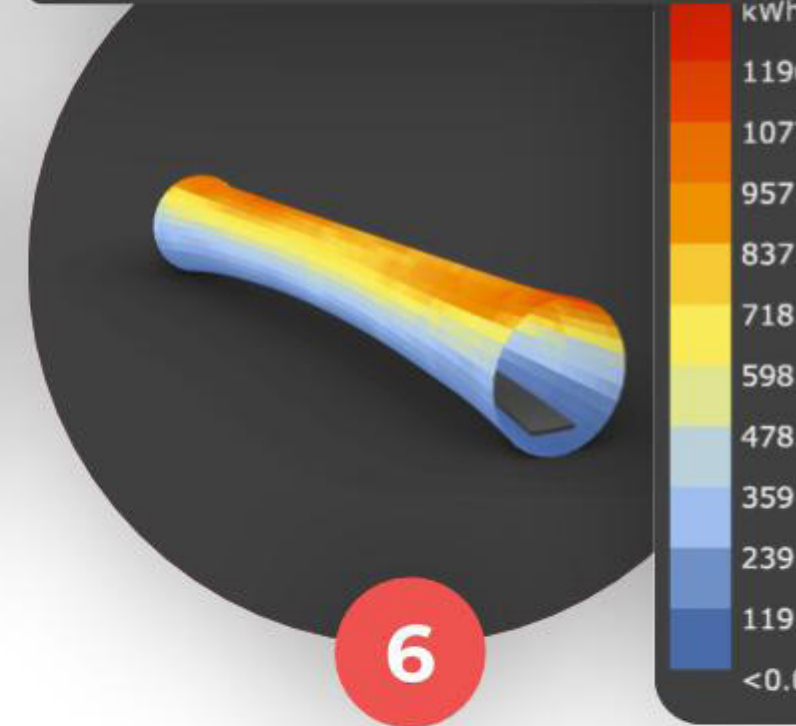
4



5



ENVIRONMENT ANALYSIS



6

OUTCOME

Generic | (Take-Away)

PREMISE

STRUCTURE

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INSTRUCTOR

CHALLENGE

1

CHAPTER

Digital Modeling

A Brief introduction to Rhinoceros with the understanding of the UI, default presets, opening, saving and exporting data, with an elaborate tutorial on points, polylines, curves and basic surfaces.

2

CHAPTER

Digital Sculpting

Basic and advanced tools to make complex surfaces. Advanced modifications tools to generate surfaces, extracting different geometries from surfaces and Boolean operations while extracting documentation drawings in Rhinoceros.

3

CHAPTER

Visual Programming

A Brief introduction with the understanding of the UI, default pre-sets opening, saving and exporting data and referencing geometry from Rhino 6. Understanding the core of Grasshopper for data management and manipulation – Lists, Trees, Sets, Clusters,

COURSE TIMINGS

02-06

DECEMBER

PREMISE

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4

CHAPTER

Algorithmic Design

Translating Rhino 6 tools into Grasshopper terminology and definitions. Learning important plugins such as Kangaroo, Weaverbird, Lunchbox, Fox, Cocoon and understanding conceptual algorithms such as the Voronoi and Attractors.

5

CHAPTER

Context Modeling

Basic and advanced tools in modelling geometry and inputting information for contextual elements from online resources. From using basic interfaces such as Cad mapper to more advanced tools for context mapping and modelling such as Elk.

6

CHAPTER

Environmental Analysis

Using Ladybug and Honeybee plugins to generate analysis models for wind, radiation and sun path. To create shadow studies and view analysis data and co-relate with grasshopper plugins to modify geometry in a dynamic and iterative workflow.

PREMISE

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COURSE TIMINGS

0930-1630
Indian Standard
Time

DAY 1	DAY 2	DAY 3	DAY 4
TIMINGS 0930- 1630(IST)	TIMINGS 0930- 1630(IST)	TIMINGS 0930- 1630(IST)	TIMINGS 0930- 1630(IST)
Lectures	Lectures	Lectures	Studio
1 CHAPTER	3 CHAPTER	5 CHAPTER	Final Challenge Introduction + Generating a typical Computational Design workflow
Lectures	Lectures	Lectures	
2 CHAPTER	4 CHAPTER	6 CHAPTER	
02 DEC	03 DEC	04 DEC	05 DEC
SESSION 1	SESSION 2	SESSION 3	SESSION 4



Angad Warang

Designer | Researcher | Design researcher | Research designer

Based in Spain and shuttling between India and the Netherlands, he is an architect who specializes in Computational Design and Digital Fabrication. He graduated with BArch from VNIT, Nagpur, India in 2012 and completed MS Arch in Biodigital Architecture from UIC, Barcelona, Spain. He is currently pursuing a PhD in Computational Design titled 'Architecture of Computational Ecosystems'. He also works as a Research Assistant in the Institute for Biodigital Architecture and Genetics, ESARQ, UIC, Barcelona.

Angad teaches Computational Design and Digital Fabrication as an Associate Professor at the Biodigital Architecture Master in UIC, Barcelona. He also teaches in several Architecture and Design institutes in India as a visiting faculty. He is constantly conducting workshops in India, Spain and the Netherlands as a contribution to his research.

He is also the co-founder and co-owner of **undesign^{labs}**, a research, design and education consultancy that specializes in digital fabrication.

<https://angadwarang.wixsite.com/2019>

PREMISE

OUTCOME

STRUCTURE

TIMELINE

INSTRUCTOR 1

CHALLENGE



Abhishek Sorumpuri

Designer | Researcher | Design researcher | Architect

is an architect and heading a research lab named SPARRO in New Delhi in the field of architecture and design. At present he is working on a platform named as uni.xyz to build a global collaborative community of designers. He is also a visiting faculty at SPA, Delhi. He graduated from VNIT Nagpur and has worked thereafter with M:OFA studio for over 6 years. He has published papers in the field of architecture and urbanism on topics like interactive public Design Systems, social network in city, intelligent facades. He has also conceptualized and is working on projects like smart dustbin, sensing façade, blockchain in city planning and urban design and has conducted workshops on the same.

PREMISE

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INSTRUCTOR 2

CHALLENGE

Madgaon

Railway Station



Madgaon Junction is one of the busiest Train Station along the Western coast. Owing to its central location within the West coast region, strategic trade location and its touristic importance, Madgaon Junction receives a huge footfall almost throughout the year. With 123 different trains passing through the junction, it is one of the busiest train stations in the Konkan region.

It is about time the station received a major technological upgrade by being supported by a state of the art design while respecting its cultural and ecological roots. The station needs an overall

Infrastructural Redesign.

Metabolic Architecture is the idea of synthesizing a design process by means of the two big design tools of nature – Anabolism and Catabolism. While anabolic activity propels growth in an organism or ecosystem, catabolic activity is responsible for decay and eventual death. But from the death and decay emerges an evolved version that furthers the anabolism and the cycle continues

This cycle has long been computerized to generate simulation models. It can now be accessed by Architects in the form of **Computational Design.**

The Challenge is to **redesign** the **Madgaon train station** by means of **computational design** in the **Metabolic Architecture** framework as described in its 3 distinct steps.

PREMISE

OUTCOME

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CHALLENGE
(Overview) | Specifics

STEP

1

COLLECTING
INGREDIENTS

This step will focus on learning
modelling, programming and
mapping to generate and
imitate structures, enclosures
and materials and collect
design ingredients

MODELING
DIGITAL SCULPTING



PROGRAMMING
ALGORITHMIC DESIGN



MAPPING
ENVIRONMENT ANALYSIS



STRUCTURE
FORM AND SPACE



ENCLOSURE
FAÇADE AND ROOF



MATERIAL
LOCAL AND INTUITIVE



CHALLENGE
Overview | (Specifics)

PREMISE

OUTCOME

STRUCTURE

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INSTRUCTOR



STEP

2

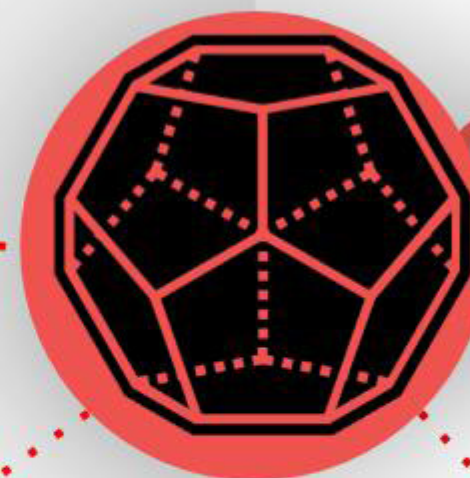
CREATING
RECIPES

At 2nd step, the inventory from step 1 would be put together to create workflows or **design recipes** by combining **context**, **typology** and **issues** with **design**, **analysis** and **fabrication**

CONTEXT
KONKAN COAST



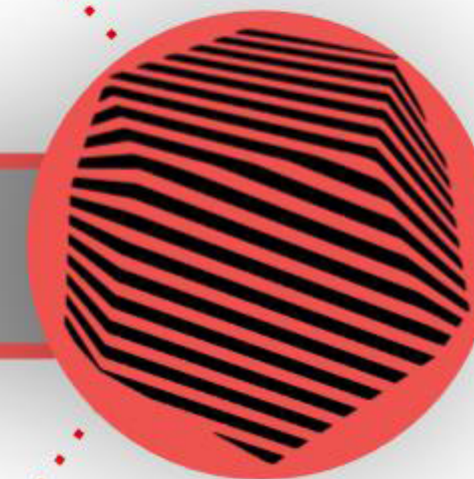
DESIGN
COMPUTATIONAL



TYPOLGY
TRAIN STATION



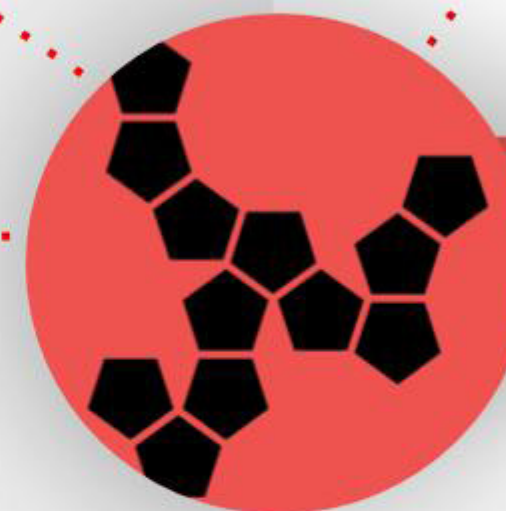
ANALYSIS
SUN AND WIND



ISSUE
INFRA-UPGRADE



FABRICATION
VERNACULAR APPROACH



PREMISE

OUTCOME

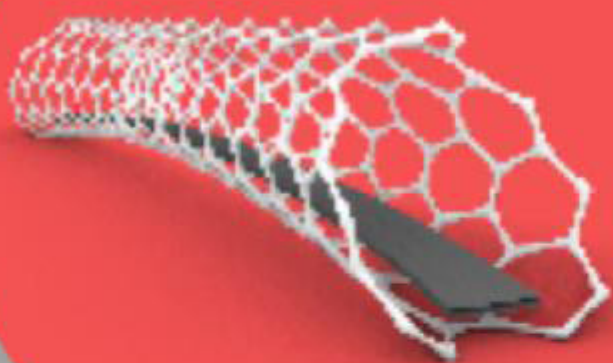
STRUCTURE

TIMELINE

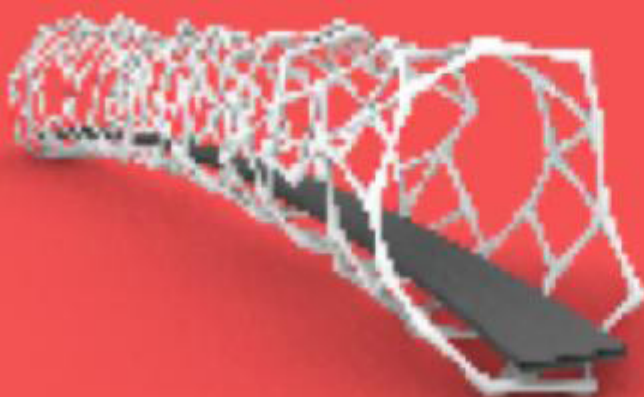
INSTRUCTOR

CHALLENGE
Overview | (Specifics)

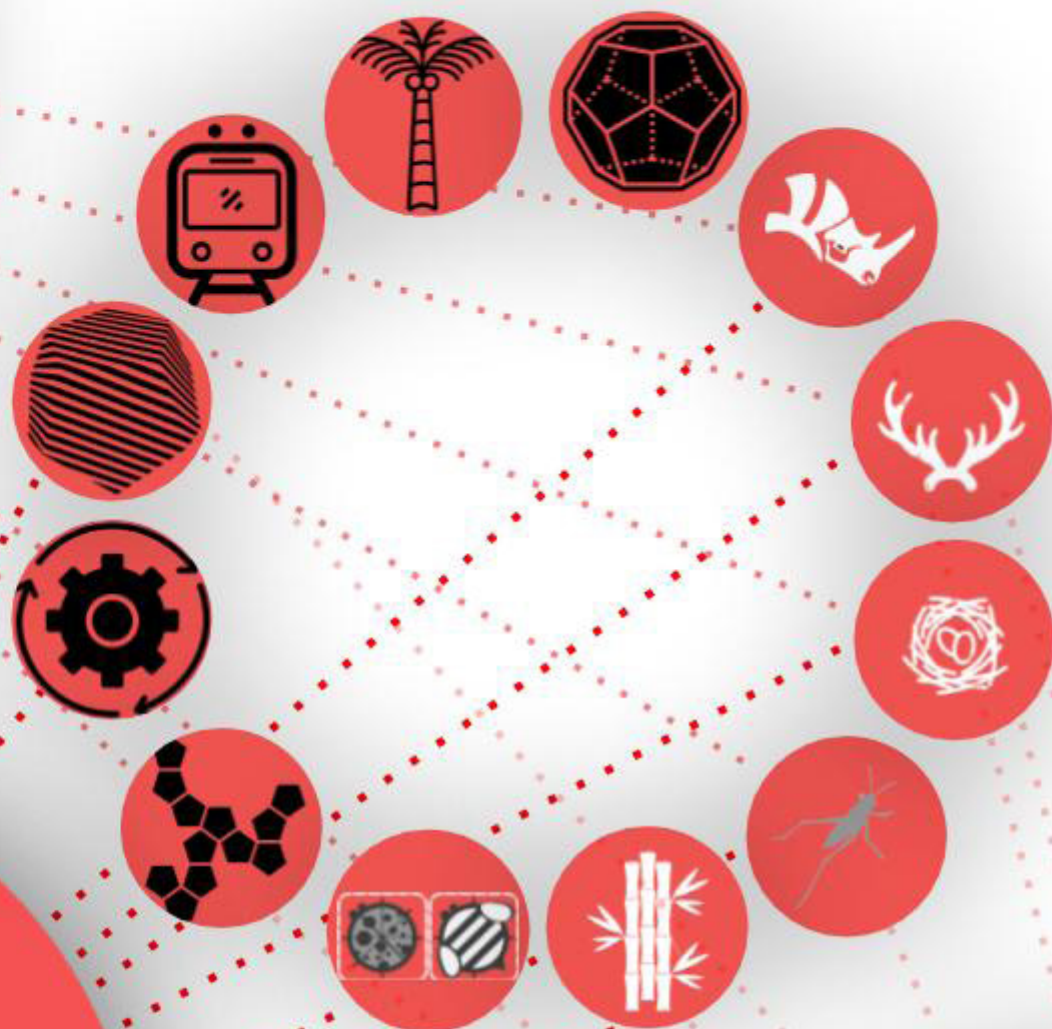
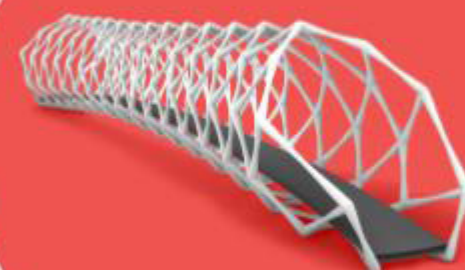
ITERATION
1



ITERATION
7



ITERATION
n



At the 3rd step, the all the ingredients and recipes will be cross-bred to **develop an entire cuisine** of different possibilities.

This rich biodiversity of design iterations will be documented in order to access specific results at any given time.

The documentation will also serve as a blueprint for **designing a design process**.

STEP

3

DEVELOPING
A CUISINE

PREMISE

OUTCOME

STRUCTURE

TIMELINE

INSTRUCTOR

CHALLENGE

Overview | (Specifics)

Each Workshop session will be **8 Hours long with live QnA's**. The Webinar will take place at **Goa College of Architecture** premises. Participants will be able to ask questions directly to the mentor, this gives Workshops a more interactive community environment.

All videos will be available, including the live streams, for your viewing as much as you like, even after the live stream as ended. This means you can enjoy the videos even if you are not available for the session.

Workshop sessions will be conducted in **English** and **there is no previous experience of the topics required**.

FAQ

Q. Who can take part in the Workshop?

A. Workshop are open for all, even if you are a school student or you are working professional. This workshop is exclusively designed towards the students of GOA COLLEGE OF ARCHITECTURE.

Q. What is the purpose of the Workshop?

A. This Workshop is intended towards the students with elective for computational design and analysis. It is intended to improve the skill-based experiences among designers or budding designers.

Q. How do I ensure that I will be learning new skills in these Workshop?

A. Workshops are intended to improve the skill-based experiences among designers or budding designers. You can refer to the brief for the detailed structure of the webinar before registering.

Q. How many people would be participating in the workshop?

A. A maximum of 40 people are allowed for 1 batch of the workshop. In order to maintain the right balance between students and mentors, we limit the ratio of 1:20 between Mentor to Student.

Q. What if i miss a session of workshop?

A. Workshop session will be available for offline viewing after all the workshop sessions have ended. Students can revisit the sessions as many times as they want after they have done the registration.

Q. Who can take part in the Workshop?

A. Workshops are open for all, even if you are a school student or you are working professional. The right of admission settles with the host college.

Q. How long would be one Workshop course?

A. This workshop course would last for 4 days. There will be three sessions one day each, giving enough time for participants to complete their webinar challenge.

Q. What would be duration of One Workshop Session?

A. One Workshop Session would be as per the timing of the college depending on the course structure and the mentor.

Q. Who reserve the rights of the outcome of the competition/workshop?

A. Organizers/Mentor/Participants all reserve the rights of the content created or produced during/after the workshop. For details read our [terms of service](#)



AWARDS

The winning entry will receive a Certificate of Merit, based on the evaluation done by the mentor on the challenge. All the other participants will receive an E-Certificate for participation.



PRICING



Students

₹3000/-



Professionals

₹4500/-

- The Above pricing is for a 4- Day workshop series conducted within the college premises.
- Students registering for the workshop would be required to submit their college ID's
- Entries to this workshop course remains with the sole discretion of the hosting college.



ABOUT

Uni Classrooms serves as a part of UNI in the realm of **Online Learning and portfolio building oriented design exercises**. Classrooms provide an online interactive cultural environment Online Webinars tend to bridge the Knowledge gap between students and the industry requirements. Learn what industry requires and be on the top of the requirement charts for the companies. Also get an edge from your peers. It intends to give opportunity to young students to explore their design skills in refreshing problems similar to their curriculum. The online lectures followed by related design challenges helps to cement the skills learnt in the webinar. Classroom Competitions embarks on the idea of creating fundamental design challenges to enhance the learning experience and education. It is a research initiative dedicated to providing opportunities for students of design schools from all domains to explore the ideas that go beyond the restrictions of usual architectural discourse.

Queries: support@uni.xyz

Discover other competitions: <http://competitions.uni.xyz>

Facebook: <https://www.facebook.com/unidesigntogether/>

Instagram: <https://www.instagram.com/uni.xyz/>

Discover FAQ's about this competition on our help forum here: <http://help.uni.xyz/>



Towards creating a **new design paradigm.**