



Parametric Design using Grasshopper

Course Objectives

1. To introduce participants to parametric thinking and visual programming concepts using Grasshopper.
2. To develop a strong understanding of data flow, components, lists, and data trees for structured parametric modeling.
3. To enable participants to create responsive geometries and pattern-based systems linked dynamically to parameters.
4. To integrate Grasshopper workflows with Rhino for efficient modeling and design exploration.
5. To build confidence in developing intermediate-level parametric definitions for real-world design applications.

Target Audience

This course is ideal for:

- Architects and Architectural Designers
- Computational Design Enthusiasts
- Product & Industrial Designers
- Engineers exploring parametric workflows
- BIM Professionals expanding into generative design
- Design Students with basic Rhino knowledge

Course Outcomes

By the end of the 3-day program, participants will be able to:

1. Understand and apply parametric modeling logic using visual programming techniques.
2. Build clean and structured Grasshopper definitions using parameters, components, and proper data management.
3. Work confidently with lists and data trees to control complex geometry systems.
4. Create parametric patterns, surface subdivisions, and attractor-based responsive designs.
5. Integrate Grasshopper models with Rhino and prepare geometry for further modeling or fabrication workflows.
6. Develop and present a small parametric project demonstrating intermediate-level skills.



Course Outline

The course comprises **24**-hours of theory and labs and is divided into **8** different Modules. Each chapter will be followed by hands-on lab exercises to reinforce learning and gauge understanding of the topics covered.

Module 1: Introduction to Parametric Design

- What is parametric modeling?
- Difference between direct modeling vs parametric workflow
- Real-world applications in architecture & product design
- Understanding algorithmic logic

Module 2: Grasshopper Interface & Workflow

- Canvas layout & component categories
- Parameters vs Components
- Wires & data flow
- Panels, sliders & number inputs
- Baking geometry into Rhino

Module 3: Creating Basic Parametric Geometry

- Points, vectors & planes
- Lines, polylines & curves
- Basic transformations (Move, Rotate, Scale)
- Creating parametric 2D patterns
- Mini exercise: Parametric grid system

Module 4: Lists & Data Trees

- Understanding lists
- Grafting, Flattening & Simplifying
- Data tree structure & visualization
- Managing complex data flows



Module 5: Working with Surfaces

- Creating surfaces from curves
- Surface domains & reparameterization
- Surface subdivision
- Paneling strategies
- Isotrim & UV logic

Module 6: Attractors & Pattern Control

- Attractor points & curves
- Distance-based manipulation
- Controlling scale & rotation parametrically
- Pattern generation techniques
- Mini exercise: Responsive façade panel

Module 7: Advanced Transformations & Form Generation

- Series & ranges
- Arrays & iterative logic
- Lofting & parametric surface creation
- Pattern deformation

Module 8: Integration with Rhino

- Referencing Rhino geometry
- Baking and model organization
- Layer control from Grasshopper
- Preparing geometry for fabrication