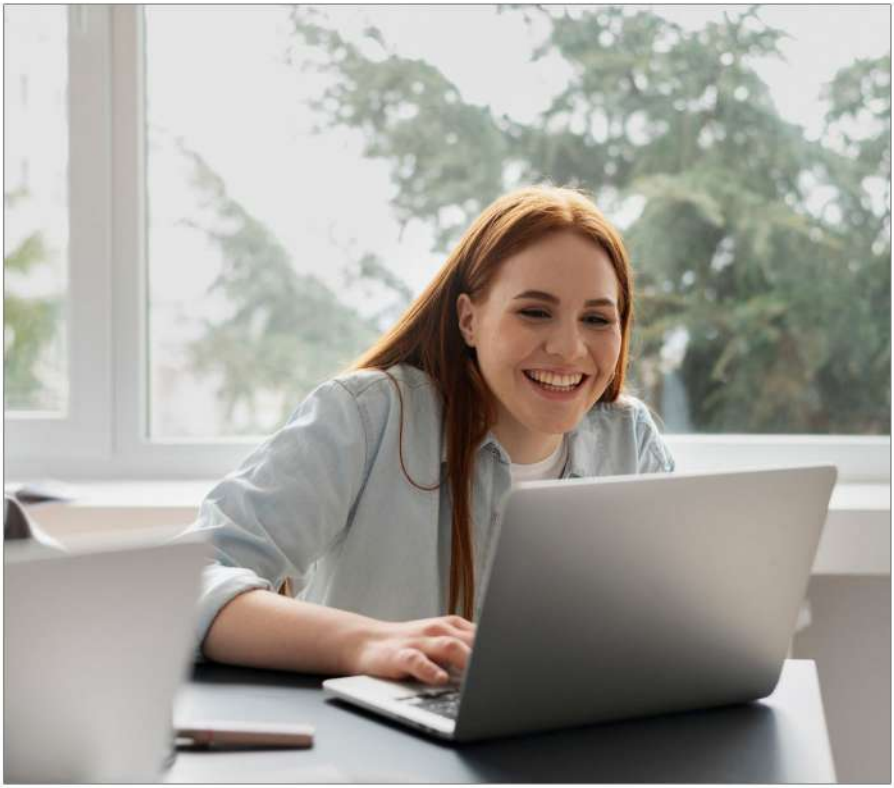
Grasshopper 3D

Zetlan Technologies



e-Learning Course

Help Desk: +91 8680961847 **www.zetlantech.com**

ZETLAN TECHNOLOGIES

COURSE MODULES

Introduction to Grasshopper 3D

- What is Grasshopper?
- Installing and setting up Grasshopper
- Interface overview: Panels, Components, and Canvas
- Understanding data flow in Grasshopper

Basic Components and Data Structures

- Parameters: Points, Curves, Surfaces, and Meshes
- Data trees and lists: Understanding branches and indexes
- Vectors and transformations (move, rotate, scale)
- Working with domains and ranges

Curve and Surface Manipulation

- Creating and modifying curves (Polyline, NURBS, Interpolatn)
- Lofting, extruding, and sweeping surfaces
- Subdividing surfaces for panelization
- Understanding UV coordinates

Mathematical and Logical Operations

- Basic math functions (addition, multiplication, sine, cosine)
- Boolean logic and conditional statements
- Graph mapping and remapping numbers
- Using expressions in Grasshopper

Parametric Modeling Concepts

- Creating parametric towers, facades, and structures
- Adaptive components for architectural design
- Attractors and point influence methods
- Working with sliders for real-time variations

Advanced Geometry & Mesh Modeling

- Introduction to Meshes vs. NURBS
- Subdivision modeling techniques
- Mesh relaxation using Kangaroo physics
- Organic forms and biomimicry

Algorithms & Computational Design

- Recursion and iterative design
- Working with Anemone (Looping in Grasshopper)
- Agent-based modeling concepts
- Generative design principles

Working with External Plugins

- Introduction to popular Grasshopper plugins:
  - Kangaroo (Physics and structural optimization)
  - Lunchbox (Paneling and pattern generation)
  - Pufferfish (Morphing and blending)
- Weaverbird (Mesh subdivision and smoothing)
- Ladybug & Honeybee (Environmental analysis)
- Human (Working with Rhino UI & rendering)

9. Structural and Environmental Analysis

- Sun path and radiation analysis (Ladybug)
- Daylighting and energy simulations (Honeybee)
- Wind and airflow studies (Butterfly)
- Structural optimization with Karamba3D

10. Data-driven Design & Fabrication

- Importing and exporting data (CSV, Excel, JSON)
- Automating workflows with Python and C#
- Preparg geometry for digital fabricatn (3D printing,laser cuttg)
- Slicing and unfolding techniques

11. Scripting & Automation

- Introduction to Python & C# scripting in Grasshopper
- Writing custom components
- Automating repetitive tasks
- Integrating with external APIs

12. Real-World Applications & Project Development

- Architectural façade design
- Generative furniture design
- Urban planning and analysis
- Robotics and interactive design
- Final project: Developing a parametric model