Computational Geometry in Architecture Training Course

Professional Development Training Course Outline

Category	Architectural Engineering	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Computational Geometry in Architecture Training Course equips architects, designers, and engineers with cutting-edge skills in computational design thinking, generative systems, and data-driven architectural form-finding. By integrating mathematics, geometry, and computational logic, participants learn to create highly optimized, adaptive, and performance-driven architectural solutions aligned with contemporary global design standards.

In today’s architecture industry, mastery of algorithmic architecture, AI-assisted design workflows, and parametric modeling tools is no longer optional it is essential. This course bridges theory and practice through immersive learning in digital geometry processing, simulation-based design, and complex surface modeling. Learners will explore how computational methods enable sustainable design innovation, structural efficiency, and next-generation architectural expression used in iconic global projects.

Programme Curriculum

Computational Geometry in Architecture Training Course

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Course Objectives

1. Master computational geometry principles for architectural design
2. Develop expertise in parametric and algorithmic modeling workflows
3. Apply generative design techniques in real-world architectural projects
4. Understand NURBS, mesh, and subdivision surface modeling systems
5. Integrate AI-driven design optimization in architecture
6. Build advanced skills in Grasshopper-based computational workflows
7. Implement data-driven design and performance-based architecture
8. Explore structural form-finding using computational logic
9. Design complex systems using algorithmic pattern generation
10. Optimize architecture using simulation and environmental analysis tools
11. Develop digital fabrication-ready geometric models
12. Enhance innovation through computational design thinking strategies
13. Produce a portfolio-ready computational architecture project

Target Audience

1. Architects and architectural designers
2. Computational design specialists
3. Urban designers and planners
4. Civil and structural engineers
5. BIM professionals
6. Architecture students and researchers
7. Interior designers exploring parametric systems
8. Digital fabrication and 3D modeling enthusiasts

Course Modules

Module 1: Foundations of Computational Geometry

- Basics of geometric thinking in architecture
- Euclidean vs non-Euclidean geometry
- Coordinate systems and transformations
- Digital representation of space
- Case Study: Zaha Hadid’s early computational forms

Module 2: Parametric Design Fundamentals

- Understanding parameters and constraints
- Rule-based design systems
- Variable-driven architectural forms

- Dependency relationships in geometry
- Case Study: Beijing Daxing Airport design logic

Module 3: Algorithmic Thinking in Architecture

- Introduction to design algorithms
- Logical structures in spatial design
- Iterative design systems
- Rule-based generative processes
- Case Study: ICD/ITKE Research Pavilion

Module 4: NURBS and Surface Modeling

- Curve and surface mathematics
- NURBS modeling techniques
- Complex surface manipulation
- Continuity and smooth transitions
- Case Study: Guggenheim Museum Bilbao

Module 5: Mesh Modeling Systems

- Polygon mesh structures
- Subdivision modeling techniques
- Mesh optimization strategies
- Topology control in design
- Case Study: Serpentine Pavilion mesh structures

Module 6: Grasshopper for Parametric Design

- Visual programming basics
- Component-based design logic
- Parametric relationships setup
- Script-free algorithm building
- Case Study: Al Bahar Towers façade system

Module 7: Generative Design Systems

- Evolutionary design algorithms
- Randomized and rule-based generation
- Multi-solution exploration
- Optimization loops
- Case Study: Autodesk generative skyscraper concepts

Module 8: Structural Form-Finding Techniques

- Tension and compression systems
- Hanging chain models
- Minimal surface geometry
- Load optimization principles
- Case Study: Munich Olympic Stadium roof

Module 9: Data-Driven Architecture

- Environmental data integration
- Sensor-based design inputs
- Performance-based modeling
- Climate-responsive systems
- Case Study: The Edge Building Amsterdam

Module 10: Simulation-Based Design

- Structural simulation basics
- Thermal and airflow analysis
- Sunlight and shading computation
- Digital performance testing
- Case Study: Singapore Gardens by the Bay

Module 11: Digital Fabrication Geometry

- CNC and 3D printing geometry
- Fabrication constraints in design
- Material-aware computational modeling
- Assembly logic systems
- Case Study: ICD/ITKE robotic fabrication pavilion

Module 12: Complex Pattern Generation

- Tessellation systems
- Voronoi and fractal geometry
- Biomimicry in architecture
- Repetitive modular systems
- Case Study: Islamic geometric façade systems

Module 13: AI-Assisted Architectural Design

- Machine learning in design generation
- Predictive modeling systems
- AI-driven optimization
- Design intelligence workflows
- Case Study: AI-generated housing prototypes

Module 14: Urban Computational Systems

- Parametric urban modeling
- Traffic and flow simulations
- Smart city geometry systems
- Spatial data integration
- Case Study: Songdo Smart City

Module 15: Final Computational Design Project

- End-to-end design workflow
- Concept to fabrication pipeline
- Portfolio development strategies
- Presentation and visualization techniques

- Case Study: Student-led parametric skyscraper design

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

Ready to enroll or request a customized program? Book online or contact us:

Register Online Now

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