Training Course on 3D GIS Modeling and Visualization

Professional Development Training Course Outline

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

Course Introduction

Unlock the power of **immersive geospatial data** with our comprehensive training on **3D GIS Modeling and Visualization** using industry-leading software, **ArcGIS Pro** and **Esri CityEngine**. Training Course on 3D GIS Modeling and Visualization is meticulously designed to transform your understanding of spatial data from a flat, two-dimensional plane into dynamic, realistic, and highly impactful 3D environments. Master the art of **digital twin creation**, **urban planning visualization**, and **smart city development** to drive informed decision-making and enhance stakeholder engagement in an increasingly complex world.

This intensive program delves into the core principles of **procedural modeling**, **advanced geospatial analysis**, and **interactive 3D scene creation**. Participants will gain practical, hands-on experience in generating stunning **3D cityscapes**, conducting intricate **line-of-sight analysis**, and simulating real-world scenarios. Equip yourself with the cutting-edge skills necessary to excel in fields demanding advanced spatial intelligence, from **architecture, engineering, and construction (AEC)** to **environmental management** and **disaster preparedness**.

Programme Curriculum

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Course Objectives

Upon completion of this course, participants will be able to:

1. Master 3D data acquisition and integration from diverse sources for robust 3D GIS projects.
2. Proficiently utilize ArcGIS Pro 3D Analyst tools for advanced terrain modeling and surface analysis.
3. Implement procedural modeling techniques in Esri CityEngine for rapid 3D city generation and urban design.
4. Develop sophisticated CGA rules for dynamic and scalable architectural modeling.
5. Conduct advanced spatial analysis in 3D, including viewshed, line-of-sight, and volume calculations.
6. Create compelling and realistic 3D visualizations for impactful presentations and public engagement.
7. Integrate Building Information Models (BIM) with GIS for comprehensive smart city applications and digital twins.
8. Automate 3D modeling workflows using scripting for enhanced efficiency and scalability.
9. Publish and share interactive 3D web scenes and web layers for collaborative decision-making.
10. Apply 3D GIS for urban planning, infrastructure development, and environmental impact assessment.
11. Perform advanced geoprocessing operations in a 3D environment to extract valuable spatial insights.
12. Explore real-time 3D data streaming and visualization techniques for dynamic situational awareness.
13. Leverage 3D GIS for disaster mitigation, emergency response, and risk assessment modeling.

Organizational Benefits

- Facilitate more informed and precise decisions through realistic 3D spatial context and advanced analysis.
- Create compelling 3D visualizations that simplify complex issues, fostering better understanding and consensus among stakeholders.
- Streamline urban planning, infrastructure development, and design workflows through automated 3D modeling and analysis.
- Optimize resource allocation and minimize errors by accurately simulating scenarios and identifying potential issues in a 3D environment.
- Gain a leading edge by leveraging cutting-edge 3D GIS technologies for superior project delivery and innovative solutions.
- Develop **digital twins** for comprehensive lifecycle management of infrastructure and urban assets.

- Enhance preparedness and response capabilities for natural disasters and urban emergencies through realistic 3D simulations.
- Foster a culture of technological advancement and enable new service offerings in the rapidly expanding **geospatial intelligence** market.

Target Audience

1. GIS Analysts and Specialists.
2. Urban Planners and Designers.
3. Architects, Engineers, and Construction (AEC) Professionals
4. Environmental Scientists and Managers.
5. Surveyors and Remote Sensing Specialists.
6. Emergency Management and Disaster Response Personnel
7. Government Officials and Policy Makers.
8. Researchers and Academics.

Course Outline

Module 1: Introduction to 3D GIS and Concepts

- Understanding the paradigm shift from 2D to 3D GIS and its benefits.
- Key 3D data types: DEMs, TINs, Point Clouds (LiDAR), 3D Objects, and textured models.
- Overview of 3D GIS applications across various industries: urban, environmental, engineering.
- Exploring ArcGIS Pro's 3D capabilities and the role of CityEngine in urban modeling.
- **Case Study:** Visualizing a proposed smart city development plan in a 3D environment to engage public stakeholders.

Module 2: ArcGIS Pro Essentials for 3D

- Navigating and customizing the ArcGIS Pro 3D environment
- Importing and managing various 3D data formats
- Symbolizing and rendering 3D data for effective visualization.
- Working with elevation surfaces, basemaps, and imagery in 3D scenes.
- **Case Study:** Setting up a 3D scene for a new infrastructure project, incorporating existing terrain and proposed designs.

Module 3: Terrain Modeling and Analysis in ArcGIS Pro

- Creating and manipulating Digital Elevation Models (DEMs) and Triangulated Irregular Networks (TINs).
- Performing advanced terrain analysis: slope, aspect, hillshade, contours.
- Conducting viewshed and line-of-sight analysis for strategic planning.
- Calculating cut and fill volumes for construction and earthwork projects.
- **Case Study:** Analyzing optimal locations for wind turbines based on terrain and visibility analysis for a renewable energy project.

Module 4: Working with 3D Features and Extrusion

- Converting 2D features to 3D by extruding polygons based on attributes
- Creating 3D points, lines, and polygons with Z-values.
- Managing and editing 3D feature classes within a geodatabase.
- Applying different symbology and rendering techniques to 3D features.

- **Case Study:** Extruding building footprints to represent existing urban structures for a city planning model.

Module 5: Introduction to Esri CityEngine

- Understanding the core concepts of procedural modeling and rule-based generation.
- Navigating the CityEngine interface and managing projects.
- Importing 2D GIS data (footprints, streets) as initial shapes for procedural generation.
- Generating initial 3D models using built-in CityEngine rules.
- **Case Study:** Rapidly generating a conceptual 3D urban layout for a new development area using default CityEngine rules.

Module 6: CGA Shape Grammar Fundamentals

- Deconstructing and understanding the syntax of CGA rules.
- Writing basic CGA rules for geometric operations: extrude, split, translate.
- Applying attributes and parameters to CGA rules for dynamic modeling.
- Debugging and optimizing CGA rule files for efficient generation.
- **Case Study:** Creating a custom CGA rule to generate different building types based on specific zoning parameters.

Module 7: Advanced CGA Rule Development

- Implementing advanced CGA operations: texture, color, and component splits.
- Developing hierarchical rules for complex architectural details
- Incorporating external data and textures into CGA rules.
- Using conditional statements and functions within CGA for intelligent modeling.
- **Case Study:** Designing a detailed procedural rule to generate a variety of realistic building facades based on different architectural styles.

Module 8: Urban Layouts and Street Networks in CityEngine

- Generating and editing intelligent street networks in CityEngine.
- Subdividing urban blocks into parcels and lots using procedural methods.
- Applying CGA rules to generate buildings along street networks and within parcels.
- Analyzing urban metrics and statistics from generated 3D models.
- **Case Study:** Creating a detailed 3D model of a city district, including street networks, parks, and buildings, for a comprehensive urban analysis.

Module 9: Data Interoperability and Workflow Integration

- Importing and exporting 3D models between ArcGIS Pro and CityEngine.
- Working with common 3D formats: OBJ, FBX, COLLADA, GLTF/GLB.
- Integrating BIM (Building Information Models) data (e.g., Revit, IFC) into 3D GIS scenes.
- Leveraging Python scripting for automating data preparation and export workflows.
- **Case Study:** Integrating a newly designed architectural model (from BIM) into an existing 3D GIS city scene for impact assessment.

Module 10: Advanced 3D Visualization Techniques

- Creating realistic lighting, shadows, and atmospheric effects in 3D scenes.
- Applying advanced texturing and material properties for enhanced realism.
- Creating animated camera paths and fly-throughs for dynamic presentations.
- Generating high-quality renderings and screenshots for reports and marketing.

- **Case Study:** Producing a professional animated fly-through of a proposed urban redevelopment project for public outreach.

Module 11: Publishing and Sharing 3D Web Scenes

- Creating and configuring Scene Layer Packages (SLPKs) from ArcGIS Pro and CityEngine.
- Publishing 3D web scenes to ArcGIS Online and ArcGIS Enterprise.
- Embedding interactive 3D scenes into web applications and dashboards.
- Understanding WebGL and browser-based 3D visualization.
- **Case Study:** Sharing an interactive 3D model of a potential landslide zone with emergency response teams via a web application.

Module 12: Digital Twin Concepts and Applications

- Understanding the concept of **digital twins** in urban environments and infrastructure.
- Integrating real-time sensor data and IoT feeds with 3D GIS models.
- Creating dynamic **digital twins** for monitoring and managing assets.
- Exploring use cases for **digital twins** in smart city operations and maintenance.
- **Case Study:** Developing a rudimentary digital twin of a building, visualizing energy consumption data in real-time within the 3D model.

Module 13: 3D GIS for Urban Planning and Geodesign

- Applying 3D GIS for zoning analysis, urban density studies, and master planning.
- Simulating the visual impact of new developments on existing cityscapes.
- Using 3D models for public participation and community engagement in planning processes.
- Exploring geodesign principles with 3D visualization tools.
- **Case Study:** Assessing the visual impact of a proposed high-rise building on a historic city center using 3D line-of-sight and shadow analysis.

Module 14: 3D GIS for Environmental and Disaster Management

- Modeling flood inundation and storm surge scenarios in 3D.
- Visualizing wildfire spread and evacuation routes in realistic 3D terrains.
- Assessing natural hazard risks and vulnerabilities in a 3D context.
- Using 3D GIS for environmental impact assessments and conservation planning.
- **Case Study:** Simulating a flood event in a coastal town, visualizing affected areas and potential impacts on infrastructure in 3D.

Module 15: Future Trends and Advanced Topics

- Exploring advancements in **real-time 3D rendering** and immersive technologies
- Introduction to **3D point cloud analysis** and advanced LiDAR processing.
- The role of Artificial Intelligence (AI) and Machine Learning (ML) in automated 3D modeling.
- Emerging trends in **cloud-based 3D GIS platforms** and data streaming.
- **Case Study:** Discussing the potential of integrating drone-captured photogrammetry with procedural modeling for rapid urban updates.

Training Methodology

This course employs a **blended learning approach** combining theoretical foundations with extensive practical, **hands-on exercises**. The methodology includes:

- **Interactive Lectures:** Engaging presentations introducing core concepts, software functionalities, and industry best practices.
- **Demonstrations:** Live software demonstrations by experienced instructors showcasing key workflows and techniques in ArcGIS Pro and CityEngine.
- **Practical Exercises:** Step-by-step guided exercises where participants apply learned concepts directly in the software, reinforcing skills.
- **Real-World Case Studies:** Analysis and application of 3D GIS techniques to solve practical problems across diverse sectors, providing context and relevance.
- **Group Discussions:** Collaborative sessions encouraging participants to share insights, troubleshoot challenges, and discuss real-world applications.
- **Project-Based Learning:** A culminating project where participants apply their comprehensive knowledge to a significant 3D modeling and visualization task, receiving personalized feedback.
- **Resource Sharing:** Access to comprehensive course materials, datasets, software setup guides, and supplementary resources for continued learning.

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.

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
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

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

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