

Training Course on Creating Immersive 3D City Models

Professional Development Training Course Outline

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

Course Introduction

Training Course on Creating Immersive 3D City Models provides a deep dive into the cutting-edge realm of **3D city modeling**, equipping participants with the essential skills and practical knowledge to design, develop, and deploy highly realistic and interactive urban environments. Leveraging advanced **geospatial technologies**, **photogrammetry**, **LiDAR data processing**, and **procedural modeling**, this program empowers professionals to transform complex urban data into **digital twins** that revolutionize **urban planning**, **smart city initiatives**, and **immersive visualization** for diverse applications. From **data acquisition** to **real-time rendering**, participants will gain hands-on experience with industry-standard software and techniques, ensuring mastery in crafting compelling **virtual cityscapes**.

The demand for **high-fidelity 3D city models** is rapidly accelerating across various sectors, driven by advancements in **Geographic Information Systems (GIS)**, **virtual reality (VR)**, **augmented reality (AR)**, and the burgeoning field of **urban digital twins**. This course addresses this critical need by providing a holistic curriculum that covers the entire workflow, from foundational concepts of **spatial data infrastructure** to advanced techniques in **3D texture mapping** and **optimization for web and mobile platforms**. Graduates will be proficient in creating dynamic and data-rich **urban simulations**, capable of supporting critical decision-making in areas such as **infrastructure development**, **disaster management**, **environmental analysis**, and **public engagement**, ultimately fostering **sustainable urban development**.

Programme Curriculum

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Course Objectives

1. Understand and implement diverse data capture methodologies, including **aerial photogrammetry**, **LiDAR scanning**, and **UAV drone mapping**, for comprehensive urban data collection.
2. Develop expertise in **point cloud registration**, **classification**, **filtering**, and **segmentation** using leading software for accurate 3D model generation.
3. Learn advanced techniques for creating high-resolution terrain and surface representations from various geospatial datasets.
4. Utilize **parametric modeling** and rule-based systems (e.g., CGA in CityEngine) for efficient and scalable creation of detailed building geometries and urban fabric.
5. Gain proficiency in **geometric modeling**, **mesh optimization**, and **LOD (Level of Detail) implementation** for performance-driven 3D city models.
6. Seamlessly combine **GIS layers**, CAD data, BIM models, and other spatial information into a unified 3D urban environment.
7. Learn to apply high-quality **PBR (Physically Based Rendering) materials**, **texture atlasing**, and **UV mapping** for photorealistic cityscapes.
8. **Optimize 3D Models for Performance and Visualization:** Understand techniques for **polygon reduction**, **occlusion culling**, and **streaming data** to ensure smooth performance across various platforms.
9. Create engaging and navigable 3D experiences using platforms like Unity or Unreal Engine for **immersive urban exploration**.
10. Analyze and apply 3D models for **urban analytics**, **environmental simulations (e.g., solar analysis, noise propagation)**, and **traffic flow simulation**.
11. Learn how to build and maintain **dynamic digital twins** of urban areas, integrating real-time data for enhanced decision-making.
12. Understand the role of **computer vision** and **deep learning** in automating aspects of 3D model generation and feature extraction.

13. Master techniques for presenting 3D city models for **public engagement, stakeholder collaboration, and urban planning proposals.**

Organizational Benefits

- Streamline planning, design, and approval processes through highly accurate and visual 3D models.
- Enable data-driven insights for infrastructure, resource allocation, and urban resilience.
- Foster greater understanding and collaboration with stakeholders through immersive visualizations.
- Utilize detailed 3D models for efficient management of city assets, utilities, and emergency services.
- Lay the foundation for comprehensive digital twins, enabling predictive analytics and intelligent urban systems.
- Identify design conflicts and optimize solutions virtually before costly physical implementation.
- Empower teams with cutting-edge skills in geospatial technology, VR/AR, and AI for future urban challenges.

Target Audience

1. Urban Planners & Designers.
2. GIS Analysts & Specialists.
3. Architects & Civil Engineers.
4. Surveyors & Geomatic Engineers.
5. Environmental Consultants.
6. Government & Municipal Officials.
7. Real Estate Developers & Investors.
8. Game Developers & Visualization Artists.

Course Modules

Module 1: Introduction to Immersive 3D City Models

- Understanding the evolution and importance of 3D city models in the digital age.
- Overview of key concepts: LOD (Level of Detail), semantic models, digital twins.
- Exploring diverse applications: urban planning, smart cities, disaster management, tourism.
- Introduction to major software platforms and their roles (e.g., ArcGIS CityEngine, Blender, Unity, ContextCapture).
- **Case Study:** The City of Singapore's "Virtual Singapore" digital twin project for urban planning and governance.

Module 2: Geospatial Data Fundamentals for 3D Modeling

- Review of GIS concepts: coordinate systems, projections, spatial data types (vector, raster).
- Sources of urban geospatial data: open data portals, satellite imagery, aerial photos.
- Data quality, accuracy, and resolution considerations for 3D modeling.
- Data formats commonly used in 3D city modeling (e.g., CityGML, OBJ, FBX, LAS).
- **Case Study:** Utilizing open government data (e.g., NYC 3D Building Data) for rapid urban modeling.

Module 3: Photogrammetry for 3D City Model Creation

- Principles of photogrammetry: image acquisition, overlap, ground control points (GCPs).
- UAV drone deployment for efficient aerial data capture.
- Processing photogrammetric datasets: sparse and dense point clouds, 3D meshes.
- Software workflow for generating textured 3D models from images (e.g., Agisoft Metashape, RealityCapture).
- **Case Study:** Reconstructing historical urban districts in 3D using archival aerial photography.

Module 4: LiDAR Data Acquisition and Processing

- Understanding LiDAR technology: airborne, terrestrial, and mobile LiDAR systems.
- LiDAR data characteristics: point density, intensity, classification.
- Processing LiDAR point clouds: noise reduction, filtering, normalization.
- Generating Digital Elevation Models (DEMs) and Digital Surface Models (DSMs) from LiDAR.
- **Case Study:** Using airborne LiDAR for precise building footprint extraction and height mapping for a new development area.

Module 5: Introduction to 3D Modeling Software and Techniques

- Navigating the interface of chosen 3D modeling software (e.g., Blender, SketchUp, 3ds Max).
- Basic 3D modeling primitives and tools: extrusion, boolean operations, modifiers.
- Topology and mesh optimization for efficient 3D models.
- Introduction to materials, textures, and UV unwrapping.
- **Case Study:** Rapid prototyping of a small urban block with various building types using SketchUp.

Module 6: Procedural Modeling with ArcGIS CityEngine

- Introduction to procedural modeling and its benefits for large-scale urban environments.
- Understanding CGA (Computer Generated Architecture) rules and their syntax.
- Generating building facades, roofs, and urban furniture using procedural rules.
- Applying real-world GIS data to drive procedural generation.
- **Case Study:** Procedurally generating an entire city district based on zoning regulations and architectural styles in CityEngine.

Module 7: Advanced Texturing and Materials

- PBR (Physically Based Rendering) workflow and its importance for realism.
- Creating and applying seamless textures: diffuse, normal, roughness, metallic maps.
- Texture atlasing and UV packing for optimization.
- Advanced material creation in 3D software (e.g., Substance Painter integration).
- **Case Study:** Texturing a historically accurate 3D model of a city landmark using real-world photographic references.

Module 8: GIS Data Integration and Geo-referencing

- Importing and integrating various GIS data formats (shapefiles, geodatabases, CAD).
- Geo-referencing 3D models to real-world coordinates.
- Working with attribute data to drive visualization and analysis.
- Data validation and cleaning for seamless integration.
- **Case Study:** Overlaying proposed infrastructure plans (CAD drawings) onto an existing 3D city model for clash detection.

Module 9: Creating Digital Terrain and Surface Models

- Techniques for generating accurate DTMs from point clouds and contours.
- Creating DSMs for representing building heights and vegetation.
- Terrain editing and sculpting for realistic landscapes.
- Hydrological modeling and watershed analysis on 3D terrain.
- **Case Study:** Simulating flood impacts on an urban area by combining a high-resolution DTM with flood inundation data.

Module 10: Urban Features and Infrastructure Modeling

- Modeling essential urban features: roads, bridges, public spaces, vegetation.
- Creating realistic street furniture, streetlights, and signage.
- Integrating transportation networks and utility infrastructure.
- Techniques for instancing and asset management for large-scale models.
- **Case Study:** Modeling a new public park within a 3D city model, including pathways, landscaping, and amenities.

Module 11: Optimization for Real-Time Visualization

- Strategies for optimizing 3D models: polygon reduction, decimation, merging.
- Level of Detail (LOD) implementation for scalable performance.
- Understanding draw calls, batching, and rendering pipelines.
- Exporting and preparing models for game engines (Unity, Unreal Engine) and web viewers.
- **Case Study:** Optimizing a large 3D city model for smooth performance on a virtual reality headset.

Module 12: Immersive Visualization and Interactive Experiences

- Introduction to game engines (Unity/Unreal Engine) for interactive 3D experiences.
- Setting up lighting, atmospheric effects, and camera animation.
- Creating interactive elements: walk-throughs, fly-throughs, data queries.
- Exploring VR/AR integration for truly immersive urban exploration.
- **Case Study:** Developing an interactive public consultation platform where citizens can explore and provide feedback on proposed urban developments in VR.

Module 13: Advanced Applications and Urban Analytics

- Solar radiation analysis for energy efficiency and urban heat island mitigation.
- Noise propagation modeling for urban planning and environmental impact assessments.
- Viewshed analysis and line-of-sight studies for building placement and security.
- Traffic flow simulation and pedestrian movement analysis within 3D environments.
- **Case Study:** Analyzing the impact of a new skyscraper on surrounding buildings' sunlight exposure and shadow casting.

Module 14: Digital Twins and Smart City Integration

- Understanding the concept of a "digital twin" in an urban context.
- Integrating real-time data from IoT sensors, traffic cameras, and environmental monitors.
- Developing dashboards and analytical tools for digital twin monitoring.
- Future trends: AI-driven urban simulations, predictive modeling, autonomous systems integration.

- **Case Study:** Building a digital twin of a university campus to optimize energy consumption and facility management.

Module 15: Project Workshop & Presentation

- Participants work on a comprehensive 3D city modeling project from data acquisition to interactive visualization.
- Guided troubleshooting and problem-solving sessions.
- Best practices for project management and collaboration in 3D urban modeling.
- Presenting final immersive 3D city models to a panel for constructive feedback.
- **Case Study:** Individual or team project to create a detailed 3D model of a chosen neighbourhood, showcasing specific urban planning interventions.

Training Methodology

- Instructor-Led Sessions.
- Hands-on Labs & Exercises.
- Software Demonstrations
- Case Studies.
- Project-Based Learning.
- Group Discussions & Collaboration
- Q&A Sessions.
- Practical Tips & Troubleshooting.
- Access to Resources.

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.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
21 Sep 2026	02 Oct 2026	Online	\$2,000
21 Sep 2026	02 Oct 2026	Physical	\$3,000
21 Sep 2026	02 Oct 2026	Physical	\$0
21 Sep 2026	02 Oct 2026	Physical	\$0
21 Sep 2026	02 Oct 2026	Physical	\$0
21 Sep 2026	02 Oct 2026	Physical	\$0
21 Sep 2026	02 Oct 2026	Physical	\$0
21 Sep 2026	02 Oct 2026	Physical	\$0

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