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 Duration

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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
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
23 Nov 2026	04 Dec 2026	Physical	$12,000

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