Training course on Digital Surveying and Geomatics for Large-Scale Projects

Professional Development Training Course Outline

Category	Civil Engineering and Infrastructure Management	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Modern large-scale infrastructure projects, ranging from sprawling transportation networks and extensive utility corridors to massive urban developments and critical environmental monitoring initiatives, demand unprecedented levels of precision, efficiency, and comprehensive data. Traditional surveying methods, while foundational, often prove to be labor-intensive, time-consuming, and less efficient for covering vast areas with the high accuracy and data density required by contemporary projects. In this context, Digital Surveying and Geomatics offers a truly transformative approach. By leveraging advanced technologies, it enables the highly efficient, accurate, and comprehensive capture, processing, analysis, and management of geospatial data, thereby facilitating superior design, construction, and ongoing monitoring for all large-scale endeavors. Training Course on Digital Surveying and Geomatics for Large-Scale Projects is meticulously designed to provide participants with the practical application of cutting-edge digital surveying technologies and core geomatics principles specifically tailored for large-scale projects. The curriculum will encompass a deep understanding of the latest Global Navigation Satellite Systems (GNSS) techniques, mastery of robotic total stations, an exploration of laser scanning (LiDAR) for acquiring dense point clouds, and the effective utilization of drone-based photogrammetry for comprehensive aerial mapping. Furthermore, participants will learn advanced data processing, rigorous quality control, the seamless integration of geospatial data into Geographic Information Systems (GIS) and Building Information Models (BIM), and the crucial role of geomatics throughout the project lifecycle. Through a balanced blend of essential theoretical foundations, extensive hands-on exercises, and practical demonstrations, this course will comprehensively prepare attendees to efficiently collect, manage, and leverage high-accuracy geospatial data to robustly support planning, design, construction, and subsequent asset management.

Programme Curriculum

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Course Objectives

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

1. Analyze the fundamental concepts of Digital Surveying and Geomatics and their critical role in large-scale infrastructure projects.
2. Comprehend the principles and operational characteristics of various digital surveying technologies (e.g., GNSS, Robotic Total Stations, Laser Scanners).
3. Master techniques for planning and executing high-accuracy data acquisition using modern surveying instruments for extensive areas.
4. Develop expertise in processing and analyzing large datasets from LiDAR, photogrammetry, and GNSS observations.
5. Formulate strategies for integrating diverse geospatial data into Geographic Information Systems (GIS) for comprehensive analysis.
6. Understand the critical role of survey control networks and geodetic reference systems for large-scale projects.
7. Implement robust approaches to quality control, error propagation, and uncertainty assessment in digital surveying.
8. Explore key strategies for applying geomatics principles for volumetric calculations, earthwork monitoring, and deformation analysis.
9. Apply methodologies for utilizing drone-based photogrammetry and remote sensing for large-area mapping and progress monitoring.

10. Understand the importance of legal aspects, data security, and ethical considerations in large-scale geomatics projects.
11. Develop preliminary skills in utilizing specialized software for point cloud processing, photogrammetric mapping, and GIS analysis.
12. Design a comprehensive digital surveying and geomatics plan for a hypothetical large-scale infrastructure project.
13. Examine global best practices and future trends in integrated geomatics, reality capture, and digital twins for large-scale project delivery.

Target Audience

This course is ideal for professionals in surveying, civil engineering, and geospatial disciplines:

1. Land Surveyors: Seeking to enhance skills in digital and advanced geomatics techniques.
2. Civil Engineers: Involved in design, construction, and management of large infrastructure.
3. Geomatics Engineers: Specializing in geospatial data acquisition and processing.
4. Project Managers: Overseeing large-scale infrastructure and development projects.
5. GIS Professionals: Integrating high-accuracy survey data into geospatial databases.
6. Construction Managers: Utilizing survey data for site layout, progress tracking, and quality control.
7. Urban Planners & Developers: Requiring precise spatial data for master planning.
8. Environmental Consultants: Conducting large-area surveys for environmental impact assessments.

Course Duration: 5 Days

Course Modules

- **Module 1: Foundations of Digital Surveying and Geomatics**
  - Define digital surveying and geomatics and their relevance to large-scale projects.
  - Discuss the evolution from traditional to modern surveying techniques.
  - Understand the key concepts: accuracy, precision, coordinate systems, geodetic datums.
  - Explore the workflow of digital data acquisition, processing, analysis, and visualization.
  - Identify the benefits of integrated geomatics for efficiency and project risk reduction.
- **Module 2: Advanced GNSS Technologies and Applications**
  - Comprehend the principles of Global Navigation Satellite Systems (GNSS) (GPS, GLONASS, Galileo, BeiDou).
  - Learn about various GNSS positioning techniques: RTK, PPK, VRS, Network RTK.
  - Master techniques for planning and executing high-accuracy GNSS surveys for large areas.
  - Discuss error sources in GNSS and methods for quality control and post-processing.
  - Apply GNSS for control network establishment and precise point positioning on large projects.
- **Module 3: Robotic Total Stations and Terrestrial Laser Scanning**
  - Develop expertise in operating and utilizing Robotic Total Stations for efficient data collection.
  - Learn about principles of Terrestrial Laser Scanning (TLS) for generating dense 3D point clouds.
  - Master techniques for planning TLS scans, registering point clouds, and extracting features.
  - Discuss the applications of TLS for as-built surveys, deformation monitoring, and volumetric calculations.
  - Apply robotic total station and TLS techniques to capture complex site geometry.
- **Module 4: Drone-based Photogrammetry and Remote Sensing**
  - Formulate strategies for using Unmanned Aerial Vehicles (UAVs) for photogrammetric mapping.
  - Understand the principles of aerial photogrammetry: image overlap, ground control points (GCPs).

    - Explore techniques for processing drone imagery to generate orthomosaics, 3D models, and DSMs/DTMs.
    - Discuss the application of remote sensing for large-area land cover mapping and change detection.
    - Apply drone photogrammetry for site progress monitoring and volumetric analysis.
- **Module 5: Geospatial Data Processing and Quality Control**
    - Understand the critical steps in processing raw survey data (GNSS, LiDAR, images) into usable geospatial products.
    - Implement robust approaches to data cleaning, filtering, and outlier removal for point clouds and imagery.
    - Explore techniques for georeferencing, coordinate transformations, and data integration from multiple sources.
    - Discuss rigorous quality control procedures, error analysis, and adherence to surveying standards.
    - Examine methods for validating the accuracy and reliability of digital survey outputs.
- **Module 6: Geographic Information Systems (GIS) for Project Management**
    - Apply methodologies for organizing, managing, and analyzing large volumes of geospatial data in GIS.
    - Master techniques for performing spatial analysis: buffering, overlay, network analysis, site suitability.
    - Understand the integration of survey data with other project information (CAD, BIM, engineering models).
    - Discuss the use of GIS for project planning, site selection, environmental impact assessment, and stakeholder communication.
    - Explore web-based GIS and cloud platforms for collaborative project data sharing.
- **Module 7: Geomatics in Construction and Infrastructure Lifecycle**
    - Explore key strategies for applying geomatics throughout the construction lifecycle (e.g., layout, machine control, as-built).
    - Learn about monitoring deformation and structural health using advanced geomatic techniques.
    - Discuss the role of digital terrain models (DTMs) and digital surface models (DSMs) in earthworks.
    - Understand the importance of geomatics data for asset management and maintenance planning.
    - Examine applications in linear infrastructure (roads, railways, pipelines) and utilities.
- **Module 8: Future Trends and Integrated Geomatics**
    - Examine global best practices and innovative applications of digital surveying and geomatics in large projects.
    - Develop preliminary skills in assessing emerging technologies: reality capture, mobile mapping, SLAM.
    - Discuss the convergence of geomatics with Building Information Modeling (BIM) and Digital Twins.
    - Explore future trends: AI for automated feature extraction, real-time precise positioning, automation in surveying.
    - Design a strategic roadmap for adopting advanced digital surveying and geomatics in an organization.

Training Methodology

- **Interactive Workshops:** Facilitated discussions, group exercises, and problem-solving activities.
- **Case Studies:** Real-world examples to illustrate successful community-based surveillance practices.
- **Role-Playing and Simulations:** Practice engaging communities in surveillance activities.
- **Expert Presentations:** Insights from experienced public health professionals and community leaders.
- **Group Projects:** Collaborative development of community surveillance plans.
- **Action Planning:** Development of personalized action plans for implementing community-based surveillance.
- **Digital Tools and Resources:** Utilization of online platforms for collaboration and learning.
- **Peer-to-Peer Learning:** Sharing experiences and insights on community engagement.
- **Post-Training Support:** Access to online forums, mentorship, and continued learning 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

- Participants must be conversant in English.
- Upon completion of training, participants will receive an Authorized Training Certificate.
- The course duration is flexible and can be modified to fit any number of days.
- Course fee includes facilitation, training materials, 2 coffee breaks, buffet lunch, and a Certificate upon successful completion.
- One-year post-training support, consultation, and coaching provided after the course.
- Payment should be made at least a week before the training commencement to Fineskill Training Center account, as indicated in the invoice, to enable better preparation.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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