Training Course on Earth Observation Data Access and Processing

Professional Development Training Course Outline

Category	GIS	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Training Course on Earth Observation Data Access and Processing outlines a specialized training course focused on **Earth Observation (EO) data access** and **advanced processing techniques**, specifically leveraging data from the **Copernicus Sentinel** and **Landsat satellite missions**. Participants will gain critical skills in **geospatial data management**, **remote sensing analysis**, and **big data processing**, essential for harnessing the power of satellite imagery across diverse applications. The curriculum emphasizes practical, hands-on learning with **open-source tools** and **cloud-based platforms**, preparing professionals for impactful contributions in environmental monitoring, urban planning, agriculture, and disaster management.

The increasing availability of **high-resolution satellite data** presents unprecedented opportunities for understanding and monitoring our planet. This course bridges the knowledge gap, equipping individuals with the expertise to navigate vast **geospatial datasets**, perform sophisticated **image processing**, and extract actionable **geospatial intelligence**. By focusing on widely used **Sentinel and Landsat data**, along with trending technologies like **machine learning for EO** and **cloud computing in remote sensing**, this training empowers participants to unlock the full potential of Earth Observation for sustainable development and informed decision-making.

Programme Curriculum

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Course Objectives

1. the principles of **remote sensing**, satellite sensor types, and data acquisition.
2. Efficiently **access and download** various Sentinel mission data (Sentinel-1, -2, -3, -5P).
3. Effectively **search, retrieve, and prepare** Landsat data (Landsat 8, 9) for analysis.
4. Apply essential **radiometric and atmospheric corrections** to EO data.
5. Implement techniques like **image enhancement, filtering, and band arithmetic**.
6. Perform **change detection, land cover classification**, and time-series analysis using EO data.
7. Gain proficiency in **QGIS, SNAP (Sentinel Application Platform)**, and Python libraries (e.g., rasterio, GDAL).
8. Explore and utilize platforms like **Google Earth Engine (GEE)** and **Copernicus DIAS**.
9. Apply **machine learning algorithms** for advanced image classification and feature extraction.
10. Design and implement practical **remote sensing applications** for real-world challenges.
11. **Interpret EO-Derived Products**: Critically evaluate and utilize **geospatial products** for decision-making.
12. Handle and process large volumes of **big EO data** efficiently.
13. Apply EO insights to support **environmental monitoring** and **climate action**.

Organizational Benefits

- Empowering teams with the ability to extract critical insights from satellite data for strategic planning and operational efficiency.
- Optimizing resource allocation in agriculture, forestry, and water management through precise EO-derived information.
- Facilitating proactive monitoring of deforestation, urbanization, climate change impacts, and natural hazards.
- Reducing reliance on expensive traditional surveying methods and leveraging scalable cloud-based solutions for large-scale analysis.
- Fostering a culture of innovation by integrating cutting-edge remote sensing technologies into existing workflows.
- Enhancing capacity for rapid assessment and response during emergencies and natural disasters.
- Supporting adherence to environmental regulations and providing robust data for reporting on sustainability initiatives.

- Upskilling employees in a rapidly evolving field, contributing to professional growth and organizational resilience.

Target Audience

1. Environmental Scientists and Researchers
2. GIS Analysts and Specialists
3. Urban Planners and Architects.
4. Agricultural Engineers and Agronomists.
5. Disaster Management and Emergency Response Personnel.
6. Government and Non-Governmental Organization (NGO) Staff.
7. University Students and Academics.
8. Data Scientists and Analysts.

Course Modules

Module 1: Introduction to Earth Observation & Remote Sensing Fundamentals

- **Concepts**: Electromagnetic Spectrum, Sensor Types (Optical, Radar), Spatial, Spectral, Temporal, Radiometric Resolution.
- **Satellite Missions**: Overview of Sentinel (Copernicus Program) and Landsat missions, their characteristics, and applications.
- **Data Models**: Understanding raster and vector data models in EO, common file formats (GeoTIFF, NetCDF).
- **Principles of Image Formation**: How satellites capture and record Earth's surface information.
- **Applications**: Broad overview of EO applications in various sectors.
- **Case Study**: Analyzing the evolution of urban sprawl in a major city using historical Landsat imagery to demonstrate spatial and temporal resolution.

Module 2: Sentinel Data Access and Pre-processing

- **Access Portals**: Navigating Copernicus Open Access Hub (SciHub), Copernicus Data Space Ecosystem, and other Sentinel data providers.
- **Data Selection**: Criteria for choosing appropriate Sentinel data products (e.g., Sentinel-1 SAR for flood mapping, Sentinel-2 MSI for vegetation).
- **Basic Pre-processing**: Radiometric calibration, atmospheric correction (e.g., Sen2Cor), and geometric correction.
- **Data Download & Management**: Efficient strategies for downloading, organizing, and storing large Sentinel datasets.
- **Metadata Interpretation**: Understanding and utilizing metadata for data quality assessment and processing parameters.
- **Case Study**: Pre-processing Sentinel-2 imagery for a specific agricultural region to correct for atmospheric effects and prepare for vegetation index calculation.

Module 3: Landsat Data Access and Processing

- **Access Portals**: Utilizing USGS EarthExplorer, Google Earth Engine, and other platforms for Landsat data.
- **Landsat Product Levels**: Understanding different processing levels (e.g., Level-1, Level-2 Surface Reflectance) and their applications.
- **Image Stacking & Mosaicking**: Combining multiple Landsat scenes and creating seamless mosaics.

- **Cloud Masking & Quality Assessment**: Techniques for identifying and mitigating cloud contamination in Landsat images.
- **Historical Data Analysis**: Leveraging the long Landsat archive for historical change detection.
- **Case Study**: Creating a time-series animation of glacier retreat in a mountainous region using Landsat data from different decades, highlighting the impact of climate change.

Module 4: Core Image Processing Techniques

- **Image Enhancement**: Contrast stretching, histogram equalization, and spatial filtering for visual interpretation.
- **Band Combinations**: Creating true-color, false-color, and custom band composites for specific analyses.
- **Spectral Indices**: Calculating vegetation indices (NDVI, EVI), water indices (NDWI), and built-up indices.
- **Image Cropping & Resampling**: Subsetting areas of interest and adjusting spatial resolution.
- **Feature Extraction**: Basic methods for identifying specific features or objects within imagery.
- **Case Study**: Mapping burned areas after a wildfire using Sentinel-2 and Landsat data by calculating Normalized Burn Ratio (NBR) and performing change detection.

Module 5: Geospatial Analysis & Classification

- **Supervised Classification**: Training and implementing algorithms (e.g., Maximum Likelihood, Support Vector Machine) for land cover mapping.
- **Unsupervised Classification**: Using clustering algorithms (e.g., K-Means) for initial data exploration and classification.
- **Accuracy Assessment**: Evaluating the quality of classification results using confusion matrices and statistical measures.
- **Change Detection**: Methods for identifying and quantifying changes on the Earth's surface over time (e.g., deforestation, urban growth).
- **Spatial Data Integration**: Combining EO data with other geospatial datasets (e.g., DEMs, vector data) for comprehensive analysis.
- **Case Study**: Performing land cover classification of a national park using Sentinel-2 data and assessing the accuracy of the generated map.

Module 6: Introduction to Open-Source EO Software (QGIS & SNAP)

- **QGIS for EO**: Importing, visualizing, and performing basic processing of Sentinel and Landsat data within QGIS.
- **SNAP (Sentinel Application Platform)**: In-depth exploration of SNAP functionalities for Sentinel-1 (SAR) and Sentinel-2 (Optical) data processing.
- **Toolboxes & Operators**: Utilizing specific toolboxes in SNAP for radiometric, geometric, and thematic processing.
- **Workflow Automation**: Creating and scripting processing chains within both QGIS and SNAP for repeatable tasks.
- **Plugin Ecosystem**: Leveraging plugins in QGIS to extend EO capabilities.
- **Case Study**: Using SNAP to process Sentinel-1 Synthetic Aperture Radar (SAR) data for flood inundation mapping following a major rainfall event.

Module 7: Cloud Computing for Earth Observation (Google Earth Engine)

- **GEE Interface & Concepts**: Understanding the Google Earth Engine Code Editor, JavaScript API, and data catalog.
- **Server-Side Processing**: Performing large-scale geospatial analysis directly on GEE's cloud infrastructure.
- **Image Collections & Filtering**: Efficiently searching, filtering, and managing vast image collections (Sentinel, Landsat) in GEE.
- **Batch Processing & Export**: Exporting processed results for further analysis or visualization.
- **Custom Scripting & Visualization**: Developing custom algorithms and creating interactive visualizations.
- **Case Study**: Monitoring agricultural drought over a large region using time-series NDVI data from Landsat and Sentinel-2 in Google Earth Engine.

Module 8: Advanced Topics & Emerging Trends in EO

- **Machine Learning for EO**: Introduction to deep learning architectures (e.g., CNNs) for image classification and object detection.
- **Big Data Analytics for EO**: Strategies for handling and processing petabytes of geospatial data.
- **Data Fusion**: Combining data from multiple sensors and platforms for enhanced analysis.
- **EO for Sustainable Development Goals (SDGs)**: Practical examples of how EO contributes to global sustainability targets.
- **Future of EO**: Discussing emerging satellites, sensor technologies, and AI advancements.
- **Case Study**: Applying a machine learning model to Sentinel-2 imagery to detect informal settlements in an urban area, demonstrating the power of AI in EO.

Training Methodology

- Interactive Lectures
- Software Demonstrations
- Practical Exercises & Labs
- Case Study Analysis.
- Group Activities & Discussions.
- Q&A Sessions
- Project-Based Learning
- Resource Sharing.

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	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
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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