Training Course on GIS for Maritime and Oceanographic Mapping

Professional Development Training Course Outline

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

Course Introduction

Geographic Information Systems (GIS) have emerged as an indispensable technology for **maritime professionals** and **oceanographic researchers** globally. Training Course on GIS for Maritime and Oceanographic Mapping is meticulously designed to equip participants with the essential **geospatial skills** required to effectively manage, analyze, and visualize complex **marine data**. From **nautical charting** to **marine spatial planning**, GIS revolutionizes how we interact with and understand our oceans, facilitating data-driven decision-making for sustainable development and environmental protection.

This intensive course will delve into the practical applications of GIS in diverse **ocean environments**, empowering attendees to leverage **remote sensing**, **hydrographic data**, and advanced **spatial analytics** to address critical challenges. Participants will gain hands-on experience with industry-leading software, developing robust capabilities in **marine resource management**, **coastal zone management**, and **oceanographic research**, ultimately enhancing their professional impact within the evolving blue economy.

Programme Curriculum

Training Course on GIS for Maritime and Oceanographic Mapping

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Course Objectives

1. Master Geospatial Data Management for Marine Environments, including acquisition, storage, and quality control of diverse oceanographic datasets.
2. Apply Advanced Cartography principles for creating high-quality, legally compliant Nautical Charts and Marine Atlases.
3. Utilize Remote Sensing and Satellite Imagery for comprehensive Ocean Monitoring and Coastal Surveillance.
4. Perform Hydrographic Survey Data processing and analysis using specialized GIS tools for accurate Seafloor Mapping and Bathymetry.
5. Implement Marine Spatial Planning (MSP) frameworks to support sustainable Ocean Governance and Resource Allocation.
6. Conduct Environmental Impact Assessments (EIA) in Coastal Zones and Marine Protected Areas (MPAs) using GIS Modeling.
7. Analyze Ocean Currents, Tides, and Wave Dynamics through Spatial Analysis for Maritime Navigation and Safety at Sea.
8. Develop and manage Geospatial Databases for large-scale Ocean Data Integration and Metadata Management.
9. Apply Machine Learning and AI techniques for predictive Oceanographic Forecasting and anomaly detection.
10. Explore Marine Biodiversity Mapping and Habitat Suitability Modeling for Conservation Biology and Ecosystem Management.
11. Understand Climate Change Impacts on Marine Ecosystems and model scenarios using GIS for Climate Resilience.
12. Leverage Web GIS and Cloud-based Platforms for collaborative Marine Data Sharing and Decision Support Systems.
13. Integrate Autonomous Underwater Vehicles (AUVs) and Unmanned Surface Vessels (USVs) data into GIS workflows for Real-time Ocean Mapping.

Organizational Benefits

- Empower staff with data-driven insights for strategic planning in maritime operations, resource management, and environmental protection.
- Streamline workflows for data acquisition, processing, and analysis, leading to significant time and cost savings.
- Ensure adherence to international maritime regulations and enhance navigation safety through accurate and up-to-date mapping.
- Foster innovation and develop cutting-edge solutions for complex marine challenges, positioning the organization as a leader in the blue economy.

- Proactively identify and manage environmental risks, natural hazards, and operational challenges using advanced spatial analysis.
- Optimize the management of marine resources, from fisheries to offshore energy, promoting long-term sustainability.
- Facilitate seamless data sharing and collaborative projects across various departments and external stakeholders.

Target Audience

1. Marine Scientists and Oceanographers.
2. Hydrographic Surveyors and Cartographers
3. Environmental Managers and Policy Makers.
4. Port and Harbor Authorities.
5. Naval and Coast Guard Personnel.
6. Offshore Energy and Aquaculture Professionals.
7. GIS Analysts and Specialists.
8. Marine and Maritime Consultants.

Course Outline

Module 1: Introduction to GIS in Maritime & Oceanography

- Fundamentals of GIS: Concepts, Components, and Applications.
- The Importance of Spatial Thinking in Marine Environments.
- Overview of GIS Software: ArcGIS Pro, QGIS, and specialized marine tools.
- Data Types and Formats in Maritime GIS
- Case Study: Using GIS for mapping historical shipwrecks and their cultural heritage significance.

Module 2: Geospatial Data Acquisition for Oceans

- Sources of Marine Data: Satellite imagery (Sentinel, MODIS), Aerial Photography.
- Hydrographic Survey Techniques: Multibeam, Single Beam, Side-scan Sonar.
- Integration of GPS/GNSS and Inertial Navigation Systems (INS) data.
- Field Data Collection using Mobile GIS and Marine Sensors.
- Case Study: Collecting bathymetric data for updating navigational charts in a busy shipping lane.

Module 3: Coordinate Systems and Projections for Marine Data

- Understanding Geodetic Datums and Coordinate Reference Systems (CRS) in a marine context.
- Transforming and reprojecting marine datasets for accurate overlay.
- Vertical Datums and their significance in bathymetry and sea-level rise studies.
- Challenges of working with global vs. local marine coordinate systems.
- Case Study: Addressing datum inconsistencies in combining historical and modern hydrographic surveys.

Module 4: Marine Data Management and Database Design

- Designing Geodatabases for Maritime and Oceanographic Information.
- Organizing and managing large volumes of marine spatial data.
- Metadata Standards (ISO 19115, OGC) for marine datasets.

- Data Quality Control and Validation techniques for oceanographic data.
- Case Study: Building a comprehensive marine geodatabase for a national marine protected area network.

Module 5: Basic GIS Operations for Marine Mapping

- Data Import, Export, and Conversion for various marine formats.
- Georeferencing and Rectification of marine imagery and charts.
- Symbolization and Cartographic Representation of marine features.
- Creating professional-quality marine maps for reports and presentations.
- Case Study: Producing a thematic map showing fishing zones and protected areas for a regional fisheries management organization.

Module 6: Advanced Spatial Analysis in Oceanography

- Buffer Analysis, Overlay Analysis, and Proximity Analysis for marine applications.
- Density Mapping and Hotspot Analysis for marine species distribution.
- Network Analysis for optimizing shipping routes and search and rescue operations.
- Introduction to Raster Analysis for oceanographic parameters
- Case Study: Analyzing potential impacts of offshore wind farm development on marine mammal habitats.

Module 7: Seafloor Mapping and Bathymetry

- Processing and visualizing multibeam and single beam echo sounder data.
- Generating Digital Elevation Models (DEMs) and Digital Bathymetric Models
- Volumetric Analysis and Contour Generation for underwater features.
- Identification of Seafloor Habitats and Geomorphic Features.
- Case Study: Mapping a newly discovered deep-sea hydrothermal vent field and its associated unique ecosystem.

Module 8: Marine Spatial Planning (MSP) with GIS

- Principles and Process of Marine Spatial Planning.
- Identifying and mapping competing ocean uses
- Conflict Resolution and Scenario Building using GIS.
- Stakeholder Engagement and Participatory GIS in MSP.
- Case Study: Developing a marine spatial plan for a multi-use coastal area balancing economic development and ecological protection.

Module 9: Environmental Monitoring and Modeling

- Mapping and monitoring water quality parameters
- Tracking oil spills and predicting their dispersion using GIS and hydrodynamic models.
- Assessing Coastal Erosion and Sediment Transport.
- Modeling Marine Plastic Pollution pathways.
- Case Study: Using GIS to monitor the impact of agricultural runoff on coastal water quality and oyster beds.

Module 10: GIS for Marine Navigation and Security

- Electronic Navigational Charts (ENCs) and their integration with GIS.
- Automatic Identification System (AIS) data analysis for vessel tracking and traffic management.

- Port and Harbor Information Systems (PHIS) for operational efficiency and security.
- Mapping and analyzing maritime boundaries and territorial waters.
- Case Study: Analyzing AIS data to identify illegal fishing activities in a designated marine protected area.

Module 11: Marine Biodiversity and Habitat Mapping

- Mapping distribution and abundance of marine species.
- Identifying and classifying different marine habitat types
- Habitat Connectivity Analysis for conservation planning.
- Using Species Distribution Models (SDMs) for conservation.
- Case Study: Mapping critical spawning grounds for endangered fish species to inform fisheries management regulations.

Module 12: Remote Sensing for Oceanographic Applications

- Principles of Satellite Remote Sensing for Ocean Color, Sea Surface Temperature, and Sea Level.
- Processing and interpreting satellite imagery for marine phenomena.
- Applications of Synthetic Aperture Radar (SAR) in maritime surveillance
- Introduction to LiDAR for coastal mapping and bathymetry.
- Case Study: Using satellite-derived ocean color data to monitor harmful algal blooms and their impact on coastal communities.

Module 13: Web GIS and Cloud Platforms for Marine Data Sharing

- Publishing marine GIS data and maps to web services.
- Developing interactive web mapping applications for oceanographic data.
- Utilizing cloud-based GIS platforms for scalability.
- Data Sharing Protocols and Open Geospacial Standards for marine data.
- Case Study: Creating an online portal for sharing real-time oceanographic sensor data with scientific researchers and the public.

Module 14: GIS for Climate Change Adaptation in Coastal and Marine Regions

- Mapping and modeling sea-level rise impacts on coastal infrastructure and ecosystems.
- Assessing coastal vulnerability to extreme weather events (storms, tsunamis).
- GIS in Marine Carbon Sequestration and Blue Carbon initiatives.
- Developing adaptation strategies for coastal communities using spatial analysis.
- Case Study: Identifying high-risk coastal areas susceptible to inundation from projected sea-level rise to inform urban planning.

Module 15: Future Trends and Advanced Topics in Marine GIS

- Introduction to 3D GIS for complex marine visualizations.
- Big Data Analytics and Machine Learning in Oceanography.
- Integration of Artificial Intelligence (AI) and Internet of Things (IoT) in marine sensing.
- Autonomous Systems (AUVs, USVs) and their role in future marine mapping.
- Case Study: Exploring the use of AI to automatically detect and classify marine debris from satellite imagery.

Training Methodology

- **Interactive Lectures and Presentations**: Clear explanations of theoretical concepts with real-world maritime examples.
- **Hands-on Practical Exercises**: Extensive use of GIS software (e.g., ArcGIS Pro, QGIS) with marine datasets.
- **Guided Case Studies**: In-depth analysis and application of GIS to solve practical problems in maritime and oceanographic contexts.
- **Group Discussions and Collaborative Projects**: Encouraging peer-to-peer learning and problem-solving.
- **Demonstrations and Software Walkthroughs**: Visualizing complex processes and functionalities.
- **Q&A Sessions**: Facilitating direct interaction with experienced instructors.
- **Resource Sharing**: Providing access to relevant datasets, academic papers, and online tutorials.

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	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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