Gis Vision India®

1 Year GIS Analyst Post Graduation Certification Program.

Training Module GVI®

Course Version 4.0. Version released date April 2024

Printed in Republic of India.

Important Notice:

The information provided in this training module is intended for educational purposes only. While every effort has been made to ensure the accuracy of the content, GIS Vision India makes no representations or warranties regarding suitability or applicability of the information contained herein. Users of this training module are encouraged to exercise their own judgment when applying the concepts and techniques presented. Any reliance you place on the information provided is strictly at your own risk, and GIS Vision India shall not be liable for any losses or damages incurred as a result of using this training module. GIS Vision India does not endorse or guarantee the quality, accuracy, or availability of any external resources mentioned. Please be aware that the field of geographic information systems (GIS) is dynamic, and technology and best practices may evolve over time. It is advisable to stay current with the latest developments in GIS through on-going education and professional development. By using this training module, you acknowledge and accept the terms and conditions outlined herein. If you do not agree with these terms, please refrain from using the content provided. For further inquiries or concerns, please contact us at info@gisvisionindia.com

Table of Contents

technologies such as GPS and CAD.

4. Advanced Spatial Analysis

- Hot spot analysis
- Cluster analysis
- Spatial interpolation techniques

5. Network Analysis

- Introduction
- Types of Network Analysis
- Best Route
- New Service Area
- Closest Facility
- Origin-Destination Cost Matrix
- Location-Allocation Analysis

6. Hydrology Analysis

- Introduction to Hydrology: Overview of hydrological processes and their importance in GIS.
- Watershed Delineation: Techniques for defining watershed boundaries using digital elevation models (DEMs).
- Flow Accumulation and Direction: Calculating flow accumulation and direction to identify stream networks.
- Hydrological Modeling: Introduction to hydrological modeling techniques for runoff estimation and flood forecasting.
- Hands-on Exercise: Watershed delineation and hydrological modeling using ArcGIS Hydrology tools or QGIS Hydrology plugins.

7. Terrain Analysis

- Digital Elevation Models (DEMs): Understanding DEM data and its applications in terrain analysis.
- Slope and Aspect Analysis: Calculating slope and aspect to understand terrain characteristics.

- Visibility Analysis: Analyzing visibility across a landscape to identify visible areas from specific vantage points.
- Terrain Classification: Classifying terrain based on slope categories (e.g., flat, moderate, steep).
- Hands-on Exercise: Terrain analysis tasks using ArcGIS Spatial Analyst or QGIS Terrain Analysis tools.

8. Cross –Section Profile Analysis

- Introduction to Cross-Section Profiles: Understanding the concept of cross-section profiles in terrain analysis.
- Profile Extraction: Extracting cross-sectional profiles from DEM data along user-defined lines.
- Profile Visualization and Analysis: Visualizing and analyzing cross-section profiles to understand terrain features such as elevation changes and slope variations.
- Interpreting Cross-Section Profiles: Interpreting cross-section profiles to identify landforms, drainage patterns, and geological features.
- Hands-on Exercise: Extracting and analyzing cross-section profiles using ArcGIS 3D Analyst or QGIS profile tools.

9. Applications in Hydrology and Environmental Management

- Flood Risk Assessment: Using hydrology and terrain analysis to assess flood risk areas.
- Watershed Management: Applying hydrology analysis to develop watershed management plans.
- Erosion and Sedimentation Studies: Using terrain analysis to study erosion and sedimentation patterns.
- Infrastructure Planning: Incorporating cross-section profile analysis in infrastructure planning for roads, pipelines and drainage systems.
- Hands-on Exercise: Integrating hydrology analysis, terrain analysis and cross-section profiling in a real-world environmental management scenarios.

10. LiDAR Data Processing

- Introduction to LiDAR data
- LiDAR data acquisition methods

- LiDAR point cloud processing
- Digital Surface Model (DSM) generation
- Digital Terrain Model (DTM) generation
- LiDAR-based feature extraction

11. Introduction to Remote Sensing

- Basics of Remote Sensing Technology: Introduction to remote sensing principles, satellite and aerial platforms and sensors.
- Image Interpretation Techniques: Introduction to basic image interpretation techniques for land cover classification and feature extraction.
- Image Processing Software: Introduction to image processing software such as ERDAS Imagine for image analysis and manipulation.
- Hands-on Exercises: Image interpretation and processing tasks using remote sensing software.

12. Remote Sensing Data Analysis

- Land Use/Land Cover Classification
- Land Use Land Cover Change Detection
- Normalized Difference Vegetation Index (NDVI)
- Normalized Difference Water Index (NDWI)
- Normalized Difference Built-up Index (NDBI)
- Land Surface Temperature (LST)

13.Cartography and Map Design

- Principles of Cartography and Map Design: Understanding cartographic principles, typography, symbolization and layout design.
- Interactive Mapping and Web Mapping: Introduction to principles of interactive and web mapping.
- Introduction to ArcGIS Pro: Basics of using ArcGIS Pro for map design and layout.
- Hands-on Exercises: Creating thematic maps, designing layouts and creating web maps using ArcGIS Pro or QGIS.

14. Advanced GIS Analysis

- Advanced Spatial Analysis Techniques: In-depth exploration of advanced spatial analysis techniques such as spatial modeling, decision support systems and geostatistics.
- Integration with Python: Introduction to using Python scripting for GIS automation and advanced analysis.
- Hands-on Exercises: Developing Python scripts for advanced GIS analysis tasks.

15. Species distribution modeling (SDM)

- Habitat suitability analysis
- Ecological niche modeling
- Landscape connectivity analysis

16. Web Mapping and GIS Applications

- Introduction to Web Mapping Technologies: Overview of web mapping technologies such as Leaflet and OpenLayers.
- Creating Interactive Web Maps: Using ArcGIS Online or QGIS Cloud to create and share interactive web maps.
- Publishing GIS Data and Services on the Web: Publishing GIS data and services on the web using ArcGIS Online or QGIS Cloud.
- Developing Custom Web Mapping Applications: Introduction to developing custom web mapping applications using JavaScript and web mapping APIs.
- Hands-on Exercises: Developing and deploying custom web mapping applications.

17. Advanced GIS Software Applications

- Introduction to Specialized GIS Software: Introduction to specialized GIS software such as MicroStation and AutoCAD.
- Integration of CAD and GIS Data: Techniques for integrating CAD and GIS data for various applications.
- 3D Modeling and Visualization in GIS: Introduction to 3D modeling and visualization techniques in GIS.
- Hands-on Exercises: Using specialized GIS software for specific applications such as 3D modeling and visualization.

18. Geospatial Machine Learning

- Introduction to Geospatial Machine Learning: Overview of machine learning techniques applied in GIS.
- Classification and Regression Algorithms: Understanding supervised learning algorithms for classification and regression tasks.
- Feature Extraction and Dimensionality Reduction: Techniques for extracting meaningful features from geospatial data and reducing dimensionality.
- Spatial Regression and Prediction: Applying machine learning models for spatial regression and prediction tasks.
- Hands-on Exercise: Implementing geospatial machine learning algorithms using Python libraries such as scikit-learn and TensorFlow within ArcGIS or QGIS environments.

19. Big Data Analytics in GIS

- Challenges and Opportunities of Big Data in GIS: Understanding the impact of big data on GIS analysis and decision-making.
- Spatial Data Processing and Analysis: Techniques for processing and analyzing large volumes of spatial data efficiently.
- Distributed Computing: Introduction to distributed computing frameworks such as Apache Hadoop and Spark for big data analytics in GIS.
- Real-time GIS Applications: Exploring real-time GIS applications and streaming data analysis.
- Hands-on Exercise: Implementing big data analytics workflows for spatial analysis using open-source tools and cloud-based platforms.

20.Project Work and Presentation

- Define Project Objectives
- Select Topic and Geographic Area
- Data Collection and Preparation
- Project Design and Workflow
- Spatial Analysis
- Analysis Results and Interpretation
- Documentation and Submission

Disclaimer: The information provided herein is intended solely for general informational purposes only. While we strive to keep the information up to date and accurate, we makeno representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability, or availability of the information, products, services, or related graphics contained in this content for any purpose. Any reliance you place on such information is strictly at your own risk. In no event will we be liable for any loss or damage, including without limitation, indirect or consequential loss or damage, or any loss or damagewhatsoever arising from the use of this information. Through this content, you may be able to link to other websites that are not under our control. We have no control over the nature, content, and availability of those sites. The inclusion of any links does not necessarily imply a recommendation or endorsement of the views expressed within them. Every effort is made to keep the content running smoothly and available. However, we take no responsibility for, and will not be liable for, the content being temporarily unavailable due to technical issues beyond our control. By using this content, you acknowledge and agree to this disclaimer. If you do not agree with these terms, please refrain from using the information provided herein. For specific professional advice or concerns, please consult with a qualified expert in the relevant field. Disclaimer for Live Online Training Classes: The following disclaimer outlines important terms and conditions related to our live onlinetraining classes: 8 1. Educational Purpose: Our live online training classes are designed for educational and informational purposes only. They are not intended to replace professional advice or guidance. Participants are encouraged to consult with qualified experts or professionals for specific and individualized guidance or recommendations. 2. No Warranties: While we strive to provide accurate and up-to-date information during our live online training sessions, we make no representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability, or availability of the information presented during the sessions. 3. Changes and Updates: Content presented during live online training classes may change or become outdated over time. We reserve the right to update, modify, or remove any content without prior notice. 4. Technical Issues: We make every effort to ensure the smooth operation of our online training platform. However, we cannot be held responsible for any technical issues or interruptions that may occur during the sessions. Participants are encouraged to have a stable internet connection and appropriate technology to access the classes. 5. Participant Responsibility: Participants in our live online training classes are responsible for their own actions, decisions, andinterpretations of the information provided. We do not

assume liability for any direct or indirect consequences resulting from participation in the training classes. 6. Recording and Distribution: Unauthorized recording, distribution, or sharing of training class content is strictly prohibited without prior written consent. 7. Registration and Payment: Registration for live online training classes is subject to specific terms and conditions, including payment policies and cancellation procedures. Please refer to our registration and payment policies for detailed information. By participating in our live online training classes, you acknowledgethat you have read, understood, and agreed to this disclaimer. If you do not agree with these terms, please do not participate in the training classes. For specific questions or concerns related to our live online training classes, please contact our support team for assistance.