

3 Months Advanced GIS & Remote Sensing Development Training Course.

Training Module GVI®

Copyright 2024©
All Rights Reserved

Course Version 4.0. Version released date April 2024

Printed in Republic of India.

The information provided in this document is exclusive property of GVI® 2024 GIS Vision India. All rights reserved. No part of this training module should be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording or other electronic or mechanical methods, without the prior written permission of the copyright owner, permitted by copyright law. For permission requests, contact [gisvisionindiamail@gmail.com]

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

1. Introduction to Geographic Information Systems (GIS)

- What is GIS?
- Definition of GIS and its significance in various fields.
- Historical development and evolution of GIS technology.
- GIS Components
- Software: Overview of popular GIS software
- Data types
- Geographic coordinate systems and projections.
- Data models: Vector and raster data structures.

2. Data Acquisition

- Data types: Topographic Maps, GPS data, Remote Sensing data.
- Data collection methods: Surveys, digitization, scanning.
- Data collection sources: Survey of India, Bhukosh, Bhuvan, USGS Earth Explorer.

3. Georeferencing

- Introduction
- Load Data
- Set Coordinate System
- Add Control Points
- Rectification

4. Digitization

- Introduction
- Shapefile and Geodatabase
- Vectorization: Point, line and polygon features
- File extensions in shapefile
- Editing and advanced editing tools
- Components in a shapefile
- Attribute table and data creation

5. Components of Map

- Map layouts
- Title
- Legend
- Scale and Cartographic Scale
- North Arrow/Compass Rose
- Grid Lines and Coordinates
- Borders and boundaries, geographic features
- Labels and Annotations
- Insets
- Grid reference, data sources and credits

6. Thematic Maps

- Choropleth Maps
- Proportional Symbol Maps
- Dot Density Maps
- Isopleth Maps
- Flow Maps
- Heat Maps
- Thematic Line Maps
- 3D Thematic Maps

7. GIS Data Analysis

- Buffer Analysis
- Overlay Analysis
- Spatial Join
- Dissolve and Merge
- Clipping and Extraction
- Spatial Statistics

8. Data Transformation and Conversion

- Vector to Raster
- Raster to Vector
- Coordinate System Transformation
- Merging and Splitting Data

- Attribute Data Transformation
- Data Extraction and Data Export
- Extraction of spatial data from excel sheets
- Conversion and editing of GPS data

9. Hydrology Analysis

- Introduction
- Importance of Hydrology in water resource management and environmental studies
- Implementation of tools for watershed management
- Watershed concept and characteristics
- Types of watersheds
- GIS Data Sources and Data Acquisition
- Topographic Data Processing
- Flow Accumulation
- Flow Direction
- Stream Network Analysis
- Watershed delineation
- Morphometric Analysis
- Flood Risk Assessment using GIS Tools
- Predictive Modeling

10. Terrain Analysis

- Introduction
- Digital Elevation Model (DEM)
- Contour Mapping
- Slope Analysis
- Aspect Analysis
- Visibility Analysis
- Hillshade Analysis
- Terrain Change Detection
- Terrain Classification
- Geological formations Analysis
- Line of Sight Analysis
- Terrain Profile and Cross-Section Analysis
- Terrain-based Suitability Analysis

11. Advanced Spatial Analysis

- Hot spot analysis
- Cluster analysis
- Spatial interpolation techniques

12. 3D Visualization and Analysis

- 3D modeling
- Terrain visualization
- Viewshed analysis
- 3D interpolation

13. Time Series Analysis

- Time-series data handling and analysis
- Change detection over time
- Trend analysis
- Seasonal decomposition

14. Network Analysis

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

15. Introduction to Remote Sensing

- What is remote sensing? How does it work?
- Overview of the electromagnetic spectrum
- Remote Sensing Platforms and its types
- Characteristics and advantages of different platforms
- Remote Sensing Data Types

16. Remote Sensing Data Processing

- Introduction
- Bands/Channels
- Layer stack
- Band Combinations
- Extraction of Area Of Interest(AOI)
- Ortho mosaic

17. Image Interpretation

- Introduction
- Visual interpretation vs. digital image processing
- Elements of Visual Image Interpretation
- Types of Digital Image Processing
- Enhancing and analyzing remotely sensed images

18. 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)

19. 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

20. Web Mapping

- Collection and Preparation of Geographic Data
- Web Map Libraries

- Base maps
- Overlay Layers
- Interactivity
- Geocoding and Search
- Data Sharing and Collaboration

21. Hazard and Risk Assessment

- Hazard mapping (e.g., flood, wildfire, earthquake)
- Risk assessment methodologies
- Vulnerability analysis
- Emergency response planning using GIS

22. Urban Growth and Land Use Planning

- Urban growth modeling
- Land suitability analysis
- Urban sprawl analysis
- Smart city planning using GIS
- Ecological Modeling

23. Species distribution modeling (SDM)

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

24. Project Work

- 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 make no 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 damage whatsoever 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 online training classes:

- 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, and interpretations 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 acknowledge that 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.