

Spatial Data Analysis using QGIS

Target Audience

This course is designed for professionals and students who want to develop practical skills in spatial data analysis and mapping using **QGIS**, an open-source Geographic Information System (GIS) platform.

The course is suitable for:

- GIS Analysts and GIS Technicians
- Surveyors and Geomatics Professionals
- Civil, Environmental, and Transportation Engineers
- Urban and Regional Planners
- Remote Sensing Professionals
- Environmental Scientists and Natural Resource Managers
- Government and Municipal GIS Professionals
- Researchers, Academicians, and Graduate Students
- Professionals involved in land management, utilities, agriculture, forestry, mining, and infrastructure projects
- Anyone interested in learning practical spatial data analysis using QGIS

Course Objectives

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

- Understand the fundamental concepts of Geographic Information Systems (GIS) and spatial data analysis.
- Learn to efficiently navigate and use the QGIS interface for managing geospatial projects.
- Import, organize, prepare, and manage raster and vector spatial datasets.
- Perform raster and vector spatial analysis using QGIS geoprocessing tools.
- Apply overlay analysis, spatial sampling, and data extraction techniques for real-world GIS applications.
- Integrate online mapping services such as Google Maps and OpenStreetMap into QGIS projects.
- Create professional-quality maps, layouts, and analytical outputs for visualization and decision-making.

- Apply QGIS workflows to solve practical spatial analysis problems across engineering, environmental, planning, and research domains.

Course Outcomes

After successfully completing this course, participants will be able to:

- Confidently work with raster and vector spatial datasets in QGIS.
- Prepare, manage, and organize spatial data for GIS analysis.
- Perform raster calculations, spatial analysis, and data conversion using QGIS.
- Execute vector geoprocessing operations including geometry editing, overlay analysis, and spatial data conversion.
- Utilize spatial sampling and attribute extraction techniques to support geospatial decision-making.
- Integrate web-based mapping services and online basemaps into QGIS projects.
- Produce accurate thematic maps, reports, and presentation-ready GIS outputs.
- Apply industry-standard QGIS workflows to support projects in infrastructure, environmental management, urban planning, surveying, agriculture, and natural resource management.

Course Outline

The course comprises **24 hours of theory and labs** and is divided into **7 comprehensive modules**. Each module is followed by practical exercises and real-world site development workflows designed to reinforce learning and evaluate the participant's understanding of the concepts covered.

Table of Contents

Module 1: Introduction to Spatial Data Analysis

- Introduction to Geographic Information Systems (GIS)
- Concepts of Spatial Data
- Introduction to Spatial Data Analysis
- Resources Required for Spatial Analysis
- Installing and Configuring QGIS
- Understanding the QGIS Interface

Module 2: Working with Spatial Data in QGIS

- Introduction to QGIS Projects
- Loading Raster and Vector Data

- Data Reading and Import
- Managing GIS Layers
- Graphics and Map Visualization
- Saving and Organizing Projects

Module 3: Data Preparation for Spatial Analysis

- Data Preparation for Spatial Analysis
- Spatial Analysis Procedures
- Preparing Spatial Datasets
- Data Validation and Quality Checks
- Practical Exercise

Module 4: Raster Data Analysis

- Raster Calculation
- Raster Analysis Techniques
- Raster Data Conversion
- Working with Raster Attributes
- Practical Exercise: Raster Processing Workflow

Module 5: Vector Data Analysis

- Vector Geometry
- Vector Geoprocessing
- Vector Analysis
- Vector Data Conversion
- Practical Exercise: Vector Editing and Analysis

Module 6: Advanced Spatial Analysis

- Overlay Operations
- Raster to Vector Conversion
- Spatial Sampling
- Extraction of Values
- Extraction of Coordinates
- Practical Exercise

Module 7: GIS Operations and Mapping

- GIS Operations using Google Maps
- Integrating OpenStreetMap with QGIS
- Working with Online Basemaps
- Map Visualization and Layout Preparation
- Exporting Maps