Spatial Data Analysis Using R and QGIS

Target Audience

This course is intended for:

- Students and research scholars in geography, environmental science, agriculture, forestry, geology, civil engineering and allied fields
- Faculty members and researchers who use spatial data in their work
- Professionals in planning, natural resource management, and government or non-government agencies
- Beginners in GIS or R who wish to build practical spatial analysis skills (no advanced prior knowledge required)

Course Objectives

The course aims to:

- Introduce the concepts of data and spatial data analysis, and the resources needed to carry out such analysis
- Familiarise participants with the R programming environment and the QGIS software
- Demonstrate how to prepare data and follow standard spatial analysis procedures
- Develop hands-on skills in raster and vector data handling, geoprocessing and conversion using both R and QGIS
- Train participants in overlay operations, sampling, and extraction of values and coordinates
- Show how Google Maps and OpenStreetMap can be used together with QGIS and R

Course Outcomes

On completing the course, participants will be able to:

- Explain key concepts of spatial data and spatial data analysis
- Use R and QGIS to read, write, visualise and prepare spatial data
- Perform raster calculation, analysis and data conversion
- Carry out vector geoprocessing, geometry operations, analysis and data conversion
- Apply overlay operations, raster-to-vector conversion, sampling and value/coordinate extraction
- Use web mapping platforms such as Google Maps and OpenStreetMap in spatial workflows
- Plan and execute a basic spatial analysis project independently

Course Outline

The course comprises **40 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.

KOENIG step forward

QGIS

Table of Contents

The course content is organised into seven modules over five days.

Module	Title and Topics	Schedule
1	**Foundations of Spatial Data and Analysis**	Day 1
1.1	Introduction	
1.2	Concepts of data	
1.3	Spatial data analysis	
1.4	Resources required	
2	**Software Orientation: R and QGIS**	Day 1
2.1	About R programming	
2.2	About QGIS	
3	**Data Preparation and Spatial Analysis Procedures**	Day 2
3.1	Data preparation for spatial analysis	
3.2	Spatial analysis procedures	
4	**Raster Data Analysis (GIS Methods – 1)**	Day 2
4.1	Data reading and writing	
4.2	Graphics operation	
4.3	Raster calculation	
4.4	Raster analysis	
4.5	Raster data conversion	
5	**Vector Data Analysis (GIS Methods – 2)**	Day 3
5.1	Vector geoprocessing	
5.2	Vector geometry	
5.3	Vector analysis	
5.4	Vector data conversion	
6	**Advanced Spatial Operations (GIS Methods – 3)**	Day 4
6.1	Overlay operation	
6.2	Raster to vector	
6.3	Sampling	
6.4	Extraction of values and coordinates	
7	**Web Mapping Platforms and Course Conclusion**	Day 5
7.1	GIS operations using Google Maps, OpenStreetMap, QGIS and R	
7.2	Conclusion	