Department of Computer Science, Gujarat Vidyapith
&
GIS Center of Excellence

Short Term Course

Course Title: Fundamentals of Geographic Information System

Lectures: 10 Hours Practical: 30 Hours Project time: 30 Hours

Course Duration: 10 weeks

Topic Number	Name of the Topic
1	Introduction to GIS
	• Concept of data, information and knowledge • Concept of Information Systems • Relevance, Definition, Evolution and Components of GIS • Usefulness and Applications of a GIS
2	Nature of geographic data and representation
	• Spatial data, spatial data types and characteristics • Contents of spatial data: spatial and attribute • Concept of discrete and continuous geographic phenomena • Raster and Vector data models and formats • Concept of map scale
3	Geographic data collection and metadata
	• Data from National Mapping Agencies • Data from other projects • Data from analog datasets • Data from Public Domain Websites • Creating new datasets: from RS satellites, GPS Receivers, ASCII files • Concept of Metadata and their usefulness
4	Coordinate Systems, Map Projections, Geo-referencing and Projecting data from one map projection to the other
	• Model of the earth and Geographic Co-ordinate System • Modeling the earth as different spheroids, ellipsoids and datums • Map projections: Definition & Types • Commonly used Map projections and their characteristics • Geo-referencing raster and vector data • Projecting data from one map projection to the other
5	GIS Database Creation, Editing and transforming from one co-ordinate system to the other
	• GIS database creation form paper maps, satellite data, ASCII files and public domain Websites • Data editing for removing location errors, topological errors and attribute errors • Other editing operations: Edge-matching and Map-mosaicing , Line simplification and Smoothing • Transforming data from one co-ordinate system to the other using Ground Control

	Points(GCPs)
6	Attribute Data in GIS
	• Representation of attribute data in a GIS • Field types supported by a GIS • Creating Tables • Relating and Joining Tables • Attribute Data Types: Nominal, Ordinal, Interval and Ratio
7	GIS Data display, exploration, query and presentation
	• Vector and raster data display and symbolization • Data exploration • Types of Queries: Spatial, Attribute and Complex • Map based data manipulation: Classification, Aggregation • Presentation in form of maps • Presentation in form of Tables and Charts
8	GIS data Analysis
	• What is spatial data analysis? • Vector data analysis: Overlay, Proximity, Statistical, Measurements and Map Manipulation Functions • Raster data analysis: Functions on rasters, Raster Calculator, Raster Reclassification, Euclidean Distance Rasters, Weighted overlay, Raster Manipulation Functions
9	3-dimensional Data Analysis

	• Concept of 3-D surface
	• Representation of a 3-D Surface: DEM, TIN, Contours
	• Deriving terrain characteristics from 3-D data
	  ○ Slope
	  ○ Aspect
	  ○ Contours
	  ○ Visibility Analysis
	  ○ 3-D Views
	  ○ Hill shading
	  ○ View-shed
	  ○ Water-shed

10	Network Analysis
	• Definition and types of Network • Applications of Network • How to create a road network • Finding the shortest path within a road network • Finding the service area of a facility