Course Type	CourseCode	Nameof the Course	L	T	P	Credits
DE	NMND510	Modelling and Analysis of Geospatial data	3	0	0	3

Objective

The course explains digital representation, modelling and analysis of geospatial phenomena and provides foundation in methods and algorithms used in GIS analysis. Focused on terrain modelling and GIS-based modelling.

Learning outcomes

Students will learn the fundamental aspects of spatial data modelling and apply appropriate spatial analytical methods for decision making in the fields of natural and social resource assessment, planning and monitoring for national development process.

Units	Course Content	Contact hours	Learning Outcomes
1	Introduction to geospatial modelling and New GIS Data Sources, Geospatial models – types and Modelling: Descriptive, prescriptive and predictive; Normalization, level of measurement,	3	Student will learn about data modelling techniques and types of Geospatial data models
2	Spatial Relationships and Data Models, Spatial Data Storage and Indexing, Spatial Data Visualization and Analytics.	3	Student will learn about Visualization and analysis of spatial data
3	Coordinate Transformations: Two-Dimensional, Conformal, Affine, Projective Coordinate Transformation. Three-Dimensional Conformal Coordinate Transformation. Map models and Map Projection Systems, Map analysis: Foundations for analysis of continuous and discrete phenomena, analysis and modelling with map algebra, Map reclassification, spatial topological and geometric modelling. Map overlay and modelling correlation between two maps. Multiple maps, types of models, Boolean logic models, Index overlay models.	10	Student will learn about coordinate transformation and map projection and overlay operations of spatial data in terms of Boolean, index overlay models.
4	Terrain Modelling and Analysis: Terrain and bathymetry mapping, mathematical and digital representations (point clouds, contour, raster, TIN), DEM preparation with field measurements	5	Student will learn about DEM, preparation of DEM with various source of data
5	Multi Criterion Decision Making: Standardisation of weights, Analytical Hierarchical Process (AHP), Spatial Decision Support System	6	Student will learn about AHP and other decision support system techniques.
6	Spatial Interpolation and Geostatistics: Local and global methods, Gravity model, Regression model,	4	Student will learn about Interpolation,

	Pattern analysis, Moran's I, Cluster analysis, Trend surface Analysis		Trend surface Analysis and Pattern analysis
7	Measurement, Calibration, & Validation: Measurements and Analysis: Sample versus Population. Graphical Representation of Geo-spatial Data. Measures of Central Tendency – Mean, Median, Mode. Mean Vector. Measures of Variation in Data -Variance Covariance and Correlation Matrices.	5	Student will learn about statistics of the data and various methods for measurement of geospatial data.
8	Technological trends in GIS: GIS customization, Data warehousing, cloud GIS, data mining, distributed spatial data infrastructure, Free and open-source tools and web resources, Introduction to spatial decision problems, GIS and decision support system, overview of Internet GIS, Location based services.	5	Student will learn about advanced techniques of geospatial data globally and applications of geospatial data in various fields
	Total	**42**	

Textbooks:

1) O'Sullivan, David and David J. Unwin (2010), Geographic Information Analysis, 2nd Edition, John Wily & Sons.

Reference Books

1. Robert P. Haining and Guangquan Li (2020) "Modelling Spatial and Spatial-Temporal Data: A Bayesian approach works in the most cases as well"

2. Jay Gao (2021) "Fundamentals of Spatial Analysis and Modelling"