COURSE CODE	**GIE-205**
COURSE NAME	**SPATIAL DATA ANALYSIS**
CREDIT HOURS	Theory: 02
	Practical: 01
	Total: 03
CONTACT HOURS	Theory: 32
	Practical: 48
	Total: 80
PREREQUISITE	MATH-361

MODE OF TEACHING:

Instruction:	Two hours of lecture per week	67%
Practical:	Three hours of Lab work per week	33%

COURSE DESCRIPTION:

The course covers a broad range of spatial data analysis methods from basic statistics to advanced computational techniques. The topics include point pattern analysis, spatial prediction based on deterministic methods and Geostatistical theory, spatial autocorrelation and regression, and raster analysis. The labs are based on ArcGIS and statistical software.

COURSE OBJECTIVES:

This course introduces the spatial data and analysis using different GIS software including ArcGIS, QGIS and GeoDA. The course covers fundamental topics such as Introduction to spatial data types, Potentials of spatial data, spatial analysis, Point pattern analysis, Lines and networks and Area, objects, and spatial autocorrelation etc.

RELEVANT PROGRAM LEARNING OUTCOMES (PLOs):

The course is designed so that students achieve following PLOs:

1	Engineering Knowledge:	☑	7	Environment and	☐

				Sustainability:	
2	Problem Analysis:	☐	8	Ethics:	☐
3	Design/Development of Solutions:	☐	9	Individual and Team Work:	☐
4	Investigation:	☐	10	Communication:	☐
5	Modern Tool Usage:	☑	11	Project Management:	☐
6	The Engineer and Society:	☐	12	Lifelong Learning:	☐

COURSE LEARNING OUTCOMES (CLOs):

Upon successful completion of the course, students will be able to:

No.	CLO	Domain	Taxonomy Level	PLO
1	Apply the advanced level concepts of spatial statistics to analyze geo-data.	Cognitive	3	1
2	Analyze geographical problems and spatial data using optimal spatial statistics.	Cognitive	4	5

PRACTICAL APPLICATIONS:

This course will enable student to analyze, describe and model the geospatial data and independently solve practical GIS problems.

TOPICS COVERED:

Theory:

Week	Topics
1	Introduction to spatial data types, Potentials of spatial data, and spatial statistics and analysis.
2	Point pattern analysis, Lines and networks, Area, objects and spatial

	autocorrelation, types of area objects. Geometric properties of areas. Boundary analysis.
3	Buffering and neighborhood function. Proximity analysis. Neighborhood Function/Analysis.
4	Modelling and storing field data. Spatial interpolation, types, methods / algorithms. Derived measures on surfaces.
5-6	Map overlay. Vector and raster overlay operations. Problems in simple Boolean polygon overlay.
7	Multivariate data. Multidimensional space.
8	Multivariate data. Multidimensional space.
9	Distance, difference, and similarity.
10	Cluster analysis
11	Principle Component Analysis PCA.
12	New approaches to spatial analysis (Inverse Distance Weightage IDW; Kriging; Thin Plate Spline etc.)
13	Interpolation techniques.
14	Surface modelling, DTM/DEM.
15	Multi-criteria and multi-attribute modelling. Uncertainties in spatial modelling.
16	Modern Trends in Spatial Data Analysis and Case Studies
17-18	**ESE**

Practicals:

No.	Topics
1	Getting Started with GeoDa
2	Creating a Choropleth Map in GeoDa
3	Attribute accuracy assessment
4	Mapping where things are, Working with categories
5	Mapping where things are, controlling which values are displayed
6	Mapping where things are, limiting values to display

7	Mapping the most and least, Mapping quantities
8	Mapping the most and least, Choosing classes
9	Mapping the most and least, Creating a map series
10	Mapping the most and least, Working with charts
11	Mapping density, displaying density for analysis; Creating dot density maps; Creating a density surface

TEXT AND MATERIAL:

Textbook (s):

a. Christopher Lloyd (2010), Spatial Data Analysis: An Introduction for GIS users. Oxford University Press. ISBN: 0199554323

References Material:

a. Michael J de Smith, Michael F Goodchild, and Paul A Longley (2007), Geospatial Analysis: A Comprehensive Guide to Principles, Techniques and Software Tools. 2nd Edition). The Winchelsea Press. ISBN: 1905886608
b. Robert P. Haining (2003), Spatial Data Analysis: Theory and Practice. Cambridge University Press. ISBN: 0521774373
c. Statistical Methods for Spatial Data Analysis (1st Edition) by Oliver Schonberger Hardback, 2004. ISBN: 1584883227

ASSESMENT SYSTEM:

1. CLOs Assessment

Cognitive	Psychomotor	Affective
Spreadsheet	Rubrics	-

2. Relative Grading

Theoretical / Instruction			67%

	Assignments 10%		
	Quizzes 10%		
	Mid Exams 30%		
	End Semester Exam 50%		
Practical Work			33%
Laboratory Work		*70%*	
	Laboratory Attendance 20%		
	Laboratory Report 20%		
	Laboratory Quiz 30%		
Viva/Quiz		*30%*	
Total			**100%**