

## Fundamentals of GIS

<b>B. Sc. (Information Technology)</b>		<b>Semester – VI</b>	
<b>Course Name: Fundamentals of GIS</b>		<b>Course Code: USIT604 (Elective-I)</b>	
<b>Periods per week (1 Period is 50 minutes)</b>		<b>5</b>	
<b>Credits</b>		<b>2</b>	
		<b>Hour s</b>	<b>Marks</b>
<b>Evaluation System</b>	<b>Theory Examination</b>	<b>2½</b>	<b>75</b>
	<b>Internal</b>	<b>--</b>	<b>25</b>

### Course Objective:

- To understand the principles of Geographical Information System
- To learn Data Management and Processing Systems Hardware and Software Trends
- To understand Spatial Referencing and Positioning
- To understand the Classification of analytical GIS Capabilities
- To understand Data visualization and its strategies

Unit	Details	Lectures
<b>I</b>	<p><b>A Gentle Introduction to GIS:</b> The nature of GIS: Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation.</p> <p><b>The real world and representations of it:</b> Models and modelling, Maps, Databases, Spatial databases and spatial analysis Geographic Information and Spatial Database Models and Representations of the real world</p> <p><b>Geographic Phenomena:</b> Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries</p> <p><b>Computer Representations of Geographic Information:</b> Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects Organizing and Managing Spatial Data The Temporal Dimension</p>	<b>12</b>
<b>II</b>	<p><b>Data Management and Processing Systems, Hardware and Software Trends</b></p> <p><b>Geographic Information Systems:</b> GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI)</p> <p><b>Stages of Spatial Data handling:</b> Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation.</p> <p><b>Database management Systems:</b> Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database.</p> <p><b>GIS and Spatial Databases:</b> Linking GIS and DBMS, Spatial database functionality.</p>	<b>12</b>
<b>III</b>	<p><b>Spatial Referencing and Positioning</b></p> <p><b>Spatial Referencing:</b> Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations</p>	<b>12</b>

	<p><b>Satellite-based Positioning:</b> Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology Data Entry and Preparation</p> <p><b>Spatial Data Input:</b> Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere</p> <p><b>Data Quality:</b> Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency</p> <p><b>Data Preparation:</b> Data checks and repairs, Combining data from multiple sources</p> <p><b>Point Data Transformation:</b> Interpolating discrete data, Interpolating continuous data</p>	
IV	<p><b>Spatial Data Analysis:</b> Classification of analytical GIS Capabilities Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification</p> <p><b>Overlay functions:</b> Vector overlay operators, Raster overlay operators Neighbourhood functions: Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis</p> <p><b>Analysis:</b> Network analysis, interpolation, terrain modeling GIS and Application models: GPS, Open GIS Standards, GIS Applications and Advances Error Propagation in spatial data processing: How Errors propagate, Quantifying error propagation</p>	12
V	<p><b>Data Visualization:</b> GIS and Maps, The Visualization Process</p> <p><b>Visualization Strategies:</b> Present or explore? The cartographic toolbox: What kind of data do I have? How can I map my data? How to map? How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series Map Cosmetics, Map Dissemination</p>	12

<b>Books and References:</b>					
<b>Sr. No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>	<b>Edition</b>	<b>Year</b>
1.	Principles of Geographic Information Systems- An Introductory Text Book	Editors: Otto Huisman and Rolf A.	The International Institute of Geoinformation Science and Earth Observation	Fourth	2009
2.	Principles of Geographic Information Systems	P.A Burrough and R.A.McDonnell	Oxford University Press	Third	1999
3.	Introduction to Geographic Information Systems	Chang Kang-tsung (Karl),	McGrawHill	7th	2013

**Course Outcome:**

After completing the course, the learner will be able to:

CO1: Understanding the importance of Geographical Information System

CO2: Comprehending the Data Management and Processing Systems.

CO3: Understanding Spatial Referencing and Positioning

CO4: Analysing GIS capabilities

CO5: Understanding Data visualization