

AC-11-03-2025
Item No. -05

Approved by the BoS in Information Technology on 05-03-2025 Item No. 05

As Per NEP 2020

Tolani College of Commerce (Autonomous)



Knowledge is Supreme

Title of the Course: Principles of Geographic Information Systems

Programme: B.Sc.(Information Technology)

Semester VI

Syllabus for 4 credits

From the academic year-2025-2026

Sr. No.	Heading	Particulars
1	Description the course:	A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. By relating seemingly unrelated data, GIS can help individuals and organizations had better understand spatial patterns and relationships.
2	Vertical:	Mandatory Electives
3	Type:	Theory and Practical
4	Credit:	4 credits
5	Hours Allotted:	60 Hours
6	Marks Allotted:	100 Marks Practical Evaluation: 40Marks Semester-End: 60 Marks
7	Course Objectives: <ol style="list-style-type: none"> 1. For students to become skilled with the acquisition, handling and analysis of geographic data 2. These skills to problems within their profession or discipline. 3. To explain the concepts of spatial referencing and positioning. 4. To explain data preparation and various analytical functions 	
8	Course Outcomes: <ol style="list-style-type: none"> 1. Demonstrate organizational skills in file and database management. 2. Give examples of interdisciplinary applications of Geospatial Information Science and Technology. 3. Apply GIS analysis to address geospatial problems and/or research questions. 4. Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to. 	

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Modules:-

Module 1: A Gentle Introduction to GIS, Geographic Information and Spatial Database Models and Representations of the real world (15 Hours)

- **The nature of GIS:** Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation.
- **The real world and representations of it:** Models and modelling, Maps, Databases, Spatial databases and spatial analysis
- **Geographic Phenomena:** Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries
- **Computer Representations of Geographic Information:** Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects

Module 2: Data Management and Processing Systems Hardware and Software Trends (15 Hours)

- **Geographic Information Systems:** GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI)
- **Stages of Spatial Data handling:** Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation.
- **Database management Systems:** Reasons for using a DBMS, Alternatives for data management, the relational data model, Querying the relational database.
- **GIS and Spatial Databases:** Linking GIS and DBMS, Spatial database functionality.

Module 3: Spatial Referencing and Positioning, Data Entry and Preparation (15 Hours)

- **Spatial Referencing:** Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations
- **Satellite-based Positioning:** Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology
- **Spatial Data Input:** Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere
- **Data Quality:** Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency
- **Data Preparation:** Data checks and repairs, Combining data from multiple sources

Module 4: Spatial Data Analysis, Classification of analytical GIS Capabilities (15 Hours)

- **Retrieval, classification and measurement:** Measurement, Spatial selection queries, Classification
- **Overlay functions:** Vector overlay operators, Raster overlay operators
- **Neighbourhood functions:** Proximity computations, Computation of diffusion, Flow computation, Raster

- **Analysis:** 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

11 Reference Books:

1. **Author:** otto huisman and Rolf A, **Title:** principal of geographic information system, **Publisher:** the international institute of geo information science and Earth observation 4th Edition year 2009
2. **Author:** P A Burrough an R A McDonnel, **Title:** principal of geographic information system, **Publisher:** Oxford university press ^{3rd} Edition year:1999
3. **Author:** Michel N, Demers **Title:** Fundamental of geographic information system, **Publisher:** Wiley 4th Edition year:2009

12 Practical Assessment: 40%

Semester End Examination: 60%

14 Format of Question Paper:

Scheme of Evaluation Pattern

**Table 1A: Scheme of Continuous Evaluation (CE/Practical)
Scheme of Evaluation Pattern**

Sub-components	Maximum Marks	Conditions for passing
1)Practical exam	30	A learner must be present for each of the sub-components
2)Journal and Viva	10	
Total	40	

**Table 1B: Scheme of Semester End Examination (SEE) Evaluation
Question Paper Pattern for Semester End Examination (SEE)**

Maximum Marks: 60

Duration: 2 Hrs.

Note: All questions are compulsory. Each question has an internal choice.

Q.1.		Attempt any three of the following	(15)
	a)		
	b)		
	c)		
	d)		
	e)		

		Attempt any three of the following	(15)
Q.2.	a)		
	b)		
	c)		
	d)		
	e)		
		Attempt any three of the following	(15)
Q.3.	a)		
	b)		
	c)		
	d)		
	e)		
		Attempt any three of the following	(15)
Q.4.	a)		
	b)		
	c)		
	d)		
	e)		

Course Name: Geographic Information Systems Practical

Periods per week (1 Period is 60 minutes)

4

Credits

2

Hours

Marks

Evaluation System

Practical Examination

2

40

Practical	Details
0	Familiarizing Quantum GIS: Installation of QGIS, datasets for both Vector and Raster data, Maps.
1	Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics
2	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping
3	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files Using Plugins, Searching and Downloading OpenStreetMap Data

4	Working with attributes, terrain Data
5	Working with Projections and WMS Data
6	Georeferencing Topo Sheets and Scanned Maps Georeferencing Aerial Imagery Digitizing Map Data
7	Managing Data Tables and Saptial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries
8	Advanced GIS Operations 1: Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data
9	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler Automating Map Creation with Print Composer Atlas
10	Validating Map data

1	Q.1	15
2	Q.2	15
3	Viva	5
4	Journal	5
5	Total	40