CVM UNIVERSITY
Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2020-21

Programme: **Bachelor of Engineering (Computer Engineering)**

Semester: **VIII**

Course Code: **102047805**

Course Title: **Geographical Information System**

Course Group: **Professional Elective Course - VI**

Course Objectives: The objectives of this course are to provide theoretical knowledge as well as practical skills of geographical information system (GIS) to make students capable of capturing, analyzing and visualize real world data. The course offers detailed knowledge on basic principles of GIS, GIS data sources and structures, spatial data analysis and GIS data modeling.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	40/14	60/21	20/07	30/10	150/52

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction to GIS** Defining GIS, GI-Systems, GI- Science and GI-Applications, real world representations: 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 and irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects, Organizing and Managing Spatial Data and Temporal Dimension.	8
2	**Data Models and Processing Systems** Data types in GIS: spatial and non-spatial, Attribute data, types of attributes, scales/ levels of measurements, map and GIS, Vector and Raster model, 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.	5

3	**Spatial Referencing and Positioning** 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, Data Entry and Preparation, 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.	**12**
4	**Spatial Data Analysis: Classification of analytical GIS Capabilities** Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification, GIS and Application models: GPS, Open GIS Standards, GIS Applications and Advances, Error Propagation in spatial data processing: How Errors propagate, Quantifying error propagation.	**5**
5	**Programming for WebGIS:** Introduction of WebGIS, needs and key feature, Basics of HTML, CSS and JavaScript for WebGIS Programming, WebGIS Services: Web Map Services, Web Feature Services, Web Coverage Services, Web Catalog Services, Client/Server, Geoserver: IGiS Server.	**6**
6	**Data Visualization** Visualization Strategies: Mapping of Data, qualitative data and mapping, terrain elevation and mapping, time series and mapping, Map Cosmetics and Map Dissemination.	**4**
	Total	**40**

List of Practicals / Tutorials:

1	Introduction of various portal for geo data i.e. Bhuvan.
2	Familiarizing Quantum GIS: Installation of QGIS, datasets for both Vector and Raster data, Maps.
3	Creating and Managing Vector Data: a) Adding vector layer b) Setting properties c) Vector Layer Formatting
4	Exploring and Managing Raster data: a) Adding raster layers, b) Raster styling and analysis, c) Raster mosaicking and clipping.
5	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files, Using Plugins and Searching and Downloading OpenStreetMap Data.
6	Working with attributes and Terrain Data and Hill shade analysis.
7	Working with Projections and WMS Data

8	Construct: a) Georeferencing Topo Sheets and Scanned Maps b) Georeferencing Aerial Imagery c) Digitizing Map Data
9	Managing Data Tables and Spatial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries.
10	Advanced GIS Operations: a) Nearest Neighbor Analysis b) Sampling Raster Data using Points or Polygons c) Interpolating Point Data.
11	Introduction on GIS web server iGiS for environment configuration.
12	Case study on various topo sheets.

Reference Books:

1	Otto Huisman and Rolf A., "Principles of Geographic Information Systems", 4th Edition, The International Institute of Geoinformation Science and Earth Observation.
2	R.Laurini and D. Thompson, "Fundamentals of Spatial Information Systems", Academic Press.
3	Getting to Know WebGIS: Pinde Fu, ESRI
4	Python Geospatial Development(2nd Edition); Erik Westra
5	Michael N.Demers, "Fundamentals of Geographic Information Systems", 4th Edition, Wiley Publications.
6	Paul Bolsatd, "GIS Fundamentals: A First Text on Geographic Information Systems", 5thEdition, XanEdu Publishing Inc
7	Reddy Anji, M. 2006. Textbook of Remote Sensing and Geographical Information Systems. BS Publications, Hyderabad.

Supplementary learning Material:	
1	NPTEL - Swayam Courses - Geographical Information System by Prof. Arun K. Saraf https://onlinecourses.nptel.ac.in/noc22_ce26/preview

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	

15%	25%	25%	15%	20%	---	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the principles of GIS and its advantages and limitations.	**15**
CO-2	Retrieve the information content of remotely sensed data.	**25**
CO-3	Analyze remote sensing, spatial and attribute data for engineering applications and spatial problems.	**35**
CO-4	Create GIS and cartographic outputs for presentation.	**25**

Curriculum Revision:	
Version:	1.0
Drafted on (Month-Year):	June-2020
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025