	GIH 403: GEOGRAPHICAL INFORMATION SYSTEM	
Unit 1	**Basics of Geographic Information System**: Definition, components, packages, capabilities and purpose of GIS. History of Geographic Information System, Development of GIS as information and decision-making system, Overview of GIS Architecture.	06 hrs
Unit 2	**Definition**: Maps and spatial information, Components of GIS, maps and spatial data. Thematic characteristics of spatial data, other sources of spatial data-sensors, survey data, air photos, satellite images and field data.	06 hrs
Unit 3	Functions and Advantages of GIS: Introduction, Functions of GIS, application areas of GIS, Advantages of GIS, Uses and limitations of GIS.	06 hrs
Unit 4	GIS Data Models: Introduction, Spatial, Thematic, and Temporal Dimensions of Geographic Data. Spatial entity Spatial data Models: Introduction and types, Spatial Resolution. Raster Data Models: Raster Data Formats – netCDF4, HDF, Geo TIFF, ESRI grid, IMG. Raster data structure - Cell-by-cell raster encoding, Run-length raster encoding, Quad-tree raster encoding. Advantages/Disadvantages of the Raster data Model.	06 hrs
Unit 5	Vector Data Models: Definition, basic types of vector data model – Point, Line and Polygon. Vector Data Models Structures: Spaghetti Data Model, topological data model. Spatial Analysis: Types of analysis- point data, line data and polygon data. Data Extract – Clip, Select, Split and Table select. Overlay analysis – Erase, Identify, Intersect, Spatial join, Union etc. Proximity analysis – Buffer, Multiple Buffers, Thiessen Polygon, point distance. Conversion from vector to raster data. Advantages / Disadvantages of the Vector Model. Vector Data Formats – shape file, AutoCAD DXF, Geo Media, GML and DLG.	06 hrs
Unit 6	**Concepts of 3D models:** Digital Elevation and Terrain Models (DEM & DTM), Generation and structure of DEM/DTM and their applications. Geospatial Triangulated Irregular Network (TIN) model, slope, aspect, hill shade. **Digitization:** Editing and Structuring of Map Data. Mode of digitization, editing, topology creation and structuring map data. Data Quality and Sources of Errors. Nature of geographic data, sources of errors in GIS data base, data quality parameters, handling errors in GIS.	06 hrs
Unit 7	**Fundamentals of GPS:** Introduction, space segments, user segments and control segments. Observation principle and signal structure, accuracy of GPS measurements, point position in gang relative positioning, methods of surveying with GPS, Static and Kinematic positioning, navigation with GPS, differential GPS, navigational receivers.	06 hrs
Unit 8	**Applications of GIS in India:** Outlines of Applications in Facility and Utility Management, Natural Resource Management, Natural Disaster Management, Coastal Zone Management, Hydrology, Atmosphere, Health and energy. Application of Open source GIS, Bhuvan, Google Earth, Geo-server and Map-server.	06 hrs