



GOVERNMENT OF INDIA
GEOLOGICAL SURVEY OF INDIA TRAINING INSTITUTE
HYDERABAD

SCHEME: ITEC

PROPOSED YEAR: 2026-27

Course Name	Duration	Maximum Seats	Minimum Seats	Stream
Geographic Information System for Geoscientists	20-01-2027 to 09-02-2027	20	10	Engineering and Technology

COURSE DETAILS

Course Name	Geographic Information System for Geoscientists
Start Date	20-01-2027
End Date	09-02-2027
Aim & Objective	To enable Geoscientists and Technicians to use GIS as a tool for Data Management and Decision Support in the Management of Earth Resources
Mode of Evaluation	Project Work and Presentation
Education Qualification	Graduate in any subject in Earth Science (Geology, Geophysics, Hydrogeology, Environmental Science, Geography, Surveying, etc.)
Work & Experience	5 Years
Target Group	Scientists, Surveyors, Teachers, Technicians, etc. dealing with Geoscientific Studies / Research on Earth Resource & Utility Management

COURSE OVERVIEW

The course in Geographic Information System for Geoscientists is designed to equip the participants with the latest trends in GIS-based spatial data processing, analysis, visualization, and decision-making. The course includes exercises and case studies with the view to develop skills in data capture, data integration, digital mapping, raster and vector geoprocessing, spatial analysis / modelling and use of GIS as a data management / decision-making tool in earth science & natural resource management, geography, forestry, hydrology, environmental science, pollution studies and other related domains.

COURSE CONTENT

- **GIS Concepts and Fundamentals:** Introduction to GIS, components and applications of GIS, spatial data models (vector and raster), planning and design of GIS projects, role of GIS in decision making.
- **Spatial Reference Systems and Map Projections:** Geographic Coordinate System and Datum, Map Projections, Universal Transverse Mercator (UTM), International Grid System, coordinate and datum transformations.
- **GIS Interface and Data Input Techniques:** Familiarization with GIS software interface, digitization of point, line and polygon features, creation and management of attribute tables, import of widely used vector and raster data formats, introduction to RDBMS concepts and SQL., etc.



- **Georeferencing and Data Transformation:** Georeferencing and rectification of maps and imagery, affine and polynomial transformations, rubber sheeting and spatial adjustment techniques.
- **Geodatabase Management and Spatial Data Handling:** Creation and management of geodatabases, feature datasets and feature classes, shapefile and geodatabase feature class creation, spatial data handling, feature class conversion (line to polygon), vector data editing and advanced editing tools.
- **Topology and Attribute Management:** Topology rules and validation, attribute domains and subtypes, attaching and managing attribute data, ensuring spatial and attribute integrity.
- **Spatial Data Visualization and Cartography:** Symbolology of oriented structural data (attitude of beds, foliation, lineation, faults, etc.), preparation of map layouts, integration of cartographic elements, creation of map packages, thematic mapping and desktop cartography.
- **Vector Spatial Data Analysis:** Proximity analysis, overlay techniques, spatial relationships and vector-based spatial analysis.
- **Interpolation Techniques:** Concept of interpolation with emphasis on deterministic interpolation methods such as IDW, Natural Neighbour, Spline, Topo to Raster and Trend surface analysis.
- **Geostatistics and Spatial Prediction:** Elements of geostatistics, concept of stationary and regionalized variables, experimental variogram and variogram modelling, introduction to ArcGIS Geostatistical Analyst, kriging techniques and error estimation in spatial prediction.
- **Digital Elevation Model (DEM) and Terrain Analysis:** Introduction to DEM, applications and derivatives of DEM, extraction of slope, aspect, Hillshade, contours and topographic profiles, drainage, basin and catchment delineation, drainage morphometry and terrain analysis.
- **3D GIS and Modelling Tools:** Least Cost Path Analysis, tools for 3D visualization of geospatial data, introduction to Model Builder.
- **Raster Data Processing and Image Analysis:** Utility of multispectral raster data processing, image visualization and enhancement, band combinations, raster calculations, NDVI and basic spectral index analysis, supervised and unsupervised classification, training sample creation and class signature development using Image Analyst tools.
- **GIS Modelling and Data Integration:** Data-driven and knowledge-driven GIS modelling approaches, preparation of factor maps, data integration using Boolean logic, Index Overlay method and Fuzzy Logic (OR, AND, PRODUCT, Gamma, etc.).
- **Applications of GIS in Geosciences and Disaster Management:** Use of GIS in spatial and temporal modelling with special reference to landslide disaster management and emerging trends in geoscientific applications of GIS.
- **GPS, Mobile Mapping and Emerging Geospatial Technologies:** Concepts of GPS and mobile mapping, downloading and integration of GPS data in GIS and Google Earth, introduction to UAV, drone and LiDAR data acquisition.
- **Exposure Visits and Indian Knowledge System (IKS):** Educational visits to INCOIS and Survey of India (SOI) for understanding operational geospatial applications; heritage and cultural visits around Hyderabad; yoga sessions as part of Indian Knowledge System.
- **Project Work and Evaluation:** Hands-on project work, project presentation, pre-training, mid-training and post-training evaluations, feedback and performance assessment.
