PART – III

14. GEO INFORMATICS ENGINEERING

i) Surveying: Chain surveying – compass surveying – plane table surveying – levelling – theodolite surveying – Temporary and permanent adjustments for level and theodolite – trigonometric levelling – tacheometry – traversing - contouring – Computation of areas and volumes.

Curve setting – simple, compound and reverse curves – transition curves – vertical curves - construction surveying – hydrographic surveying – route survey – triangulation – astronomical survey – Electromagnetic distance measurement – Total station and GPS surveying – adjustment of errors in surveying.

Remote Sensing: Components of RS – electromagnetic spectrum – wave theory, particle theory, Stefan Boltzmann law and Wien's law – radiation sources – radiation quantities – EMR interaction with atmosphere and earth materials – platforms and sensors – data product types- digital data file formats – resolution concept – elements of visual interpretation – interpretation keys.

Advanced remote sensing: Principles, Characteristics and applications of thermal, hyperspectral, microwave and LIDAR images.

Digital Image Processing: Sources of Image degradation and correction procedures – preprocessing – image enhancement techniques – image classification – spectral discrimination – pattern recognition concepts – Baye's approach – signature and training sets – separability test – supervised classification – minimum distance to mean, parallelepiped, MLC – unsupervised classifiers – ISODATA, K-means – support vector machine – segmentation (spatial, Spectral) – tree classifiers – accuracy assessment.
Advanced classifiers – fuzzy set classification – sub – pixel classifier – hybrid classifiers, texture based classification – object based classifiers – artificial neural nets – hebbian leaning – expert system, types and examples – knowledge systems.

Photogrammetry: Types of photographs – photographic overlaps – film – based and digital aerial cameras – construction – camera accessories – Camera calibration – geometric properties of aerial photographs – stereo plotters & orientation – aerotriangulation – terrain modeling – orthophoto – digital photogrammetry work station and its components – analytical stereo plotters vs digital photogrammetry – work station basic system function – storage system – stereoscopic viewing and measuring system – photogrammetry project planning – other acquisition systems – UAV – terrestrial imaging, oblique photography, close range photogrammetry, terrestrial and mobile LIDAR.

Cartography: Cartography: Functions, uses and types of maps – map scales and contents – map projections – shape, distance, area and direction properties – map co-ordinate systems – elements of a map – map Layout principles – symbols and conventional signs – map lettering – map production and reproduction – map generalization – geometric transformations.

Digital Cartography: Data capture and representation – digital map design – geovisualization – digital map modelling.

Geographical information system: Components of a GIS – data and attributes – scales/levels of measurements – spatial data models – raster and vector data structures – data entry – scanner – raster data Input – raster data file formats – georeferencing – vector data input – digitiser – datum projection and reprojection – coordinate transformation – topology – adjacency, connectivity and containment – topological consistency – non topological file formats – attribute data linking – linking external databases – GPS data integration – raster to vector and vector to raster conversion – data quality – completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – metadata – GIS standards – interoperability – OGC – spatial data infrastructure – data output – map compilation – chart/graphs.

Spatial analysis and applications: raster analysis – vector analysis – network analysis – surface and geostatistical analysis – customization – web gis – mobile mapping.

RS and GIS Applications: RS and GIS applications in the fields of agriculture and forestry, urban planning, hydrology and water resources, oceanography, geology, meteorology, environmental management, climate change and disaster mitigation & management.