Course Type	Course Code	Name of Course	L	T	P	Credit
DE4	MND 403	GEOSPATIAL TECHNOLOGY IN MINING	3	0	0	9

Course Objective

The course will give a detailed insight into applications of Geospatial Technologies mainly GNSS, GIS & Remote Sensing and LIDAR in mines.

Learning Outcomes

Upon successful completion of this course, students will:
- Understand the working principle and possible applications of GNSS systems in mines
- Application of Remote Sensing & GIS in mine surveillance monitoring and resource utilization
- Learn the map projections and National GRID system
- Geo-referencing and digitization for feature extractions from raster images and updating old maps

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Introduction to Geospatial Techniques and tools**: concepts of Geodesy, Photogrammetry, Remote Sensing, GNSS and GIS.	3	An overview of geospatial tools
2	**Remote Sensing:** Introduction to remote sensing, sensors, platforms and their characteristics.	5	An understanding of Remote Sensing capabilities
3	**GIS:** Introduction to GIS, components, raster and vector data models, DBMS and Digital mapping	4	An overview of GIS and its application in digital mapping
4	**GNSS systems and their Applications**	6	Usages of GNSS in geo-fencing, delineation of surface features, leasehold documentation etc.
5	**Theory and principles of UAV systems**: Types of drones, sensors, application in surveying and mapping	7	Principle and application of Drones including sensor deployments on drones for digital mapping
6	**Map Projection and Connection to National Grid**: Classification of Map projections - Cassini, Conformal, Lambert's Polyconic grids and UTM, Coal Grid, Connection of mines surveys with National Grid and its importance, Transformation of Coordinates.	4	Need of projection systems, application of various projection systems
7	**Georeferencing and Digitization:** Registering the scanned map/plan in the required coordinate system. Extraction of features from the map/plan layer wise and its storage in digital format, generation of report, export and import the plan in various formats.	5	Conversion of raster maps into vector format and updating old scanned map including conversion into digital maps
8	**Remote Sensing, GIS and GNSS:** Application of Remote Sensing, GIS and GNSS in Land use/land cover pattern assessment of mine leasehold areas; mine environment monitoring and analysis.	4	Usages of RS, GIS and GNSS in land pattern assessment, mine closure planning and compliance monitoring
9	**Monitoring of Open Pit Slopes and dump slopes through Advanced Surveying Technology:** Slope Stability Radar (SSR), LIDAR and Spaceborne SAR Interferometry.	4	Advanced real-time slope monitoring systems Design guidelines

Reference Books:
1. Ralph W. Kiefer and Thomas Lillesand: Remote Sensing and Image Interpretation
2. Kang-tsung Chang: Introduction to Geographic Information Systems
3. Rao: Global navigation satellite systems