COURSE NAME:	Aerial Surveying & Mapping Techniques
TOTAL DURATION:	45 Hrs
MODE OF DELIVERY	PHYSICAL CLASSROOM TRAINING AT RESPECTIVE COLLEGES
TRAINER TO STUDENT RATIO:	1:50
TOTAL MARKS:	75

Table 1	
OVERALL COURSE OBJECTIVE:	1. Enable learners to understand and compare different drone technologies, sensors, and their applications in data collection. 2. Equip learners with skills to design and execute flight plans while adhering to safety protocols and operational guidelines. 3. Provide learners with the expertise to process drone data using photogrammetry and GIS tools to create actionable outputs. 4. Guide learners in integrating drone data with advanced analysis techniques for innovative problem-solving in various fields. 5. Empower learners to present data-driven recommendations effectively through well-structured reports, visualizations, and project presentations.

LEARNING OUTCOME:	1. Analyze drone technologies and data types to evaluate their suitability for various applications, including survey and mapping tasks. 2. Design efficient flight plans and data collection strategies that ensure safety, regulatory compliance, and optimal data quality. 3. Evaluate processing tools and techniques to generate high-quality outputs like Ortho mosaics, 3D models, and GIS-compatible maps. 4. Develop innovative solutions using advanced spatial analysis and integration of drone data for real-world decision-making. 5. Create compelling reports and presentations that effectively communicate actionable insights and propose solutions to stakeholders.

TABLE 2: MODULE WISE COURSE CONTENT AND OUTCOME				
SL.NO	**MODULE NAME**	**MODULE CONTENT**	**MODULE LEARNING OUTCOME**	**DURATION (HRS)**
1	Drone Technologies and Data Fundamentals	● Compare different drone technologies and their applications. ● Analyze types of data collected by drones, including images, LiDAR, and multispectral data.	● Differentiate between drone technologies based on capabilities and applications. ● Categorize drone-captured data into appropriate formats for further analysis.	9
2	Flight Planning and Data Acquisition	● Design safe and efficient flight paths for data collection. ● Test various survey techniques and apply safety protocols during operations.	● Construct effective flight plans to optimize data collection. ● Justify survey and safety strategies for different operational contexts.	9

3	Data Processing and Photogrammetry	● Evaluate data formats and software tools used for drone data processing. ● Develop Ortho mosaics, 3D models, and stitched images using photogrammetry techniques.	● Appraise the suitability of software tools for specific data types. ● Create high-quality visual outputs like maps and 3D models from raw drone data.	9
4	GIS Integration and Advanced Analysis	● Integrate drone data into GIS platforms for spatial analysis. ● Analyze multispectral and thermal imaging data for applications such as vegetation health and heat mapping	● Evaluate GIS tools for their effectiveness in visualizing and interpreting drone data. ● Innovate solutions by analysing advanced data for decision-making in targeted scenarios	9
5	Data Interpretation and Practical Applications	● Conduct hands-on data analysis using real-world datasets.	● Critique processed data for accuracy and usability in decision-making.	9

		● Develop and present a comprehensive project using drone data for a specified application.	● Propose data-driven solutions through well-structured final project presentations.	

TABLE 3: OVERALL COURSE LEARNING OUTCOME ASSESSMENT CRITERIA AND USE CASES

Learning Outcome	Assessment Criteria	Performance Criteria	Use Cases
Analyze aerial and ground survey data	Compare the outputs from drones and ground-based GPS tools for accuracy and consistency.	Categorize datasets based on source and reliability; identify discrepancies.	Evaluate the effectiveness of drones versus traditional methods for creating digital elevation models.
Evaluate data integration strategies	Critique the integration of aerial and ground survey datasets. Justify techniques used for merging datasets effectively.	Assess errors in combined datasets and validate integration outputs.	Propose methods to reduce spatial distortions in urban land-use mapping.
Design survey missions for diverse environments	Develop detailed flight plans including altitude, overlap, and sensor settings for specific applications.	Create optimized plans demonstrating efficiency, safety, and compliance with regulatory standards.	Generate a drone survey mission to monitor environmental changes in a coastal region.
Create actionable	Develop visual reports with	Formulate compelling	Propose sustainable land-use strategies

insights from processed survey data	actionable recommendations for stakeholders.	presentations with maps, 3D models, and analysis summaries tailored to the target audience.	based on vegetation index data derived from multispectral drone imagery.
Innovate solutions to real-world challenges using advanced drone data	Present a project proposing novel applications of drone technology to address complex surveying challenges.	Construct detailed project proposals supported by data, technical justifications, and feasibility studies.	Invent a drone-based solution for flood monitoring and early warning in rural regions.

TABLE 4: LIST OF FINAL PROJECTS	
SL.NO	**FINAL PROJECT**
1	Campus Mapping
2	Agricultural Land Analysis
3	Park or Recreational Area Survey
4	Disaster Management Mapping
5	Urban Land Use Mapping
6	Heritage Site Documentation
7	Coastal Area Monitoring
8	Wildlife Habitat Survey
9	Transportation and Road Mapping
10	Environmental Impact Assessment
11	Renewable Energy Site Survey (e.g., solar farm layout)
12	Watershed Mapping and Analysis
13	Vegetation Health Monitoring in Urban Areas
14	Tourism and Recreation Mapping for Local Attractions
15	Flood Risk Assessment Using Aerial Survey Data
16	Infrastructure Mapping for Road Repairs or New Construction
17	Forest Density and Deforestation Mapping
18	Riverbank Erosion and Monitoring Study

19	Urban Heat Island Effect Analysis Through Aerial Imaging
20	Mapping and Accessibility Assessment of Public Transport Routes

TABLE 5: COURSE ASSESSMENT RUBRICS (TOTAL MARKS: 75)					
ASSESSMENT CRITERIA	**Learning Outcome**	**Fair (0–5)**	**Good (6–10)**	**Excellent (11–15)**	**TOTAL MARKS**
Data Loading and Cleaning	Analyze aerial and ground survey data	Displays limited ability to identify discrepancies or categorize datasets; lacks consistency in comparing drone and ground-based data outputs.	Demonstrates an adequate ability to categorize datasets, with occasional discrepancies; basic but functional comparison of drone and GPS outputs.	Accurately categorizes datasets, identifies all discrepancies, and provides detailed analysis comparing drone and GPS outputs for accuracy.	15
Flight Planning and Execution	Design survey missions for diverse environments	Develops incomplete or inefficient flight plans; limited safety and compliance considerations.	Creates reasonably effective flight plans with basic safety measures and compliance; shows some understanding of efficiency in settings like altitude and overlap.	Constructs optimized, detailed flight plans that ensure safety, compliance, and high efficiency in sensor settings and overlap for diverse scenarios.	15
Data Integration and Processing	Evaluate data integration strategies	Shows limited ability to critique or validate integration	Demonstrates a fair ability to critique and validate	Critiques integration strategies thoroughly, validates	15

		techniques; outputs contain significant errors.	integration techniques; some errors in combined datasets, but basic justification is provided.	outputs with minimal errors, and justifies all techniques used effectively.	
Data Visualization and Interpretation	Create actionable insights from processed survey data	Visual reports lack clarity or actionable recommendations; insights are poorly communicated or incomplete.	Produces adequate reports with basic recommendations; visualizations highlight insights reasonably but lack advanced clarity or creativity.	Delivers exceptional reports with actionable recommendations, advanced visualizations, and impactful presentations tailored to the audience.	15
Innovative Solutions Using Drone Data	Innovate solutions to real-world challenges using advanced drone data	Proposals lack novelty or technical justification; insufficient supporting data or feasibility analysis.	Proposes reasonably innovative solutions with fair technical justification and supporting data; feasibility analysis is partially complete.	Presents highly innovative solutions with strong technical justifications, comprehensive supporting data, and a well-detailed feasibility analysis.	15