COURSE CURRICULUM

DRONE SURVEYING

ABOUT THE COURSE

This course provides students with practical skills in drone operation and aerial surveying, enabling them to plan, fly, and process drone-based surveys. The students will use industry-standard tools and software to collect geospatial data, generate 2D and 3D survey outputs, and integrate results into GIS platforms. The course also explores real-world applications in construction, agriculture, mining, and environmental monitoring.

COURSE NAME:	Drone Surveying
TOTAL DURATION:	60 HRS
MODE OF DELIVERY	PHYSICAL CLASSROOM TRAINING AT RESPECTIVE COLLEGES
TRAINER TO STUDENT RATIO:	1:60
TOTAL MARKS:	70 (External) + 30 (Internal)

TABLE 1	
OVERALL COURSE OBJECTIVE	• Operate drones for surveying, plan and execute flight missions, collect and process geospatial data, and develop real-world industry applications using drone technology.
LEARNING OUTCOME	• Demonstrate safe drone operation including pre-flight checks and mission execution. • Plan flight missions using software tools for surveying tasks. • Collect aerial data and convert it into 2D/3D survey outputs using processing tools. • Integrate survey data into GIS platforms for spatial analysis. • Apply drone surveying to real world problems in construction, agriculture, and environmental monitoring.

TABLE 2: MODULE-WISE COURSE CONTENT AND OUTCOME				
SL. NO.	MODULE NAME	MODULE CONTENT	MODULE LEARNING OUTCOME	DURATION (HRS)
1	Introduction to Drone Surveying	Basics of drone use in surveying, types of drones/sensors, geospatial principles,	Identify drone types, sensors, and legal	12

		drone regulations	regulations applicable in drone surveying	
2	Drone Operations & Flight Planning	Pre-flight checks, manual control, safety, mission planning using software, risk assessment	Perform safe flight operations and create flight plans tailored to survey tasks	12
3	Data Collection and Processing	Aerial imagery capture, photogrammetry, orthomosaic generation, 3D modeling, intro to GIS	Generate orthomosaics and 3D models using drone data; incorporate them into GIS for spatial analysis	12
4	Applications & Industry Trends	Use cases in agriculture, mining, urban planning; advanced sensors; ethical aspects; AI and automation	Evaluate and propose drone solutions for specific industries; address ethical and technical challenges	12
5	Capstone Project and Review	Project planning, execution, presentation, peer feedback	Create, process, and present a full drone surveying project demonstrating all skills acquired.	12

TABLE 3: OVERALL COURSE LEARNING OUTCOME ASSESSMENT CRITERIA AND USE CASES		
LEARNING OUTCOME	**ASSESSMENT CRITERIA**	**USECASES**
Demonstrate safe drone operation including pre-flight checks and mission execution.	Prepares and executes drone flight adhering to safety checklists	Flight demonstration for surveying a college ground
Plan flight missions using software tools for surveying tasks.	Designs flight path considering altitude, GSD, and coverage	Mapping a sports field or a college campus using Pix4Dcapture or DroneDeploy
Collect aerial data and convert it into 2D/3D	Captures high-resolution imagery and	Creating a topographic map of a garden or municipal park

survey outputs using processing tools.	processes orthomosaics and point clouds	
Apply drone surveying to real world problems in construction, agriculture, and environmental monitoring.	Presents a solution using drone data for a practical problem in agriculture or construction	Creating a drainage plan for an agricultural field based on drone data
Execute a full-cycle drone surveying project and present to stakeholders	Completes a capstone project with complete documentation and team presentation	Survey and model a fictional construction site, present deliverables using PowerPoint and GIS layers

TABLE 4: LIST OF FINAL PROJECTS (20 PROJECTS THAT COMPREHENSIVELY COVER ALL THE LEARNING OUTCOME)	
S. NO.	FINAL PROJECT TITLE
1	Drone survey of a school campus and 2D Ortho mosaic map generation
2	Construction site drone survey and 3D terrain model
3	Agricultural land mapping with NDVI layer generation
4	Urban road condition monitoring using aerial footage
5	Forest cover change detection using drone imagery
6	Flood-prone area mapping using aerial elevation data
7	Mine boundary mapping and safety compliance check
8	Drone-assisted environmental impact assessment
9	Drone flight plan optimization for a large field survey
10	Roof inspection for solar panel installation planning
11	Aerial surveillance of waste disposal in rural area
12	GIS-integrated planning for school infrastructure expansion
13	Identifying water bodies for rainwater harvesting using drone images
14	Use of drone surveying for city park design and layout
15	Slope analysis and erosion detection using 3D models
16	Creating a campus navigation map from drone data
17	Visualizing traffic flow with periodic drone surveys
18	Crop yield estimation using aerial analytics
19	Tree census using drone image classification
20	Drone mapping and analysis for road widening project

TABLE 5: COURSE ASSESSMENT RUBRICS (TOTAL MARKS: 70)				
ASSESSMENT CRITERIA	**FAIR**	**GOOD**	**EXCELLENT**	**TOTAL MARKS**
Prepares and executes drone flight adhering to safety checklists	Executes flight with frequent errors, partial safety compliance	Completes flight with minor errors, safety mostly followed	Fully complies with all flight protocols and demonstrates control	10
Designs flight path considering altitude, GSD, and coverage	Designs basic path, lacks optimization	Creates optimized path with minor gaps	Plans mission considering all key parameters: overlap, GSD, terrain	10
Captures high-resolution imagery and processes orthomosaics and point clouds	Produces low-quality maps with processing errors	Generates usable maps with minor stitching/clarity issues	Delivers professional-quality orthomosaics and models	15
Presents a solution using drone data for a practical problem in agriculture or construction	Struggles to integrate drone data into GIS tools	Successfully integrates but with limited analysis	Uses GIS to extract insights and apply in industry context	15
Completes a capstone project with complete documentation and team presentation	Incomplete or vague project, poor clarity	Clear objectives and results, minor presentation flaws	Well-documented project, excellent visuals, confidently presented	20
Total				**70**

Technical Specification

S. No.	Details	Specifications
1	Software/Tools used	QGIS, Version 3.22
2	Kit(s) used	DRONE Training Kit **Specification:** **1.** Brushless Motor for Drone 1400KV **2.** Pro-Range Propellers Glass Fiber Nylon Black 1CW+1CCW-1pair **3.** BLDC ESC Electronic Speed Controller with Connectors **4.** Quadcopter Frame (PCB Version with 5. Integrated PCB) + Plastic Landing Gear Combo Kit

		5. Orange 7.4V 2200mAh 30C 2S Lithium Polymer Battery Pack **6.** Cables **7.** Multimeter - 1 Nos **8.** Soldering Kit - 1 Nos **9.** tools & zipties
3	Total Kits Available	60 Kits
4	No. of kits per batch	10 Kit per batch of 60 students
5	Major Demonstration Kits	Real-size Drone for 1-day demo for each college
6	Certification	Joint certification from TNSDC and TNUAVC