

COURSE NAME:	Drone Applications with Surveillance 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:	<ol style="list-style-type: none"> 1. Analyze the fundamentals of drone technology and its applications across sectors, including surveillance, disaster management, and defense. 2. Evaluate DGCA regulations and certifications required for drone operations and commercial applications. 3. Examine the principles of drone surveillance, payload integration, and ground control software for operational efficiency. 4. Assess the importance of advanced drone components, such as gimbals, cameras, and material design, in enhancing functionality. 5. Create comprehensive solutions for drone-based projects, integrating advanced technologies like AI and hyperspectral imaging.
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LEARNING OUTCOME:	<ol style="list-style-type: none"> 1. Categorize the types of drones and their specific applications in various industries. 2. Appraise DGCA regulations and demonstrate the ability to operate drones within compliance standards. 3. Evaluate the use of advanced payloads and software programming in drone surveillance. 4. Design and assemble a drone, including hardware integration and autopilot configuration. 5. Develop practical solutions for real-world scenarios using drones, such as surveillance, mapping, and emergency management.
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TABLE 2: MODULE WISE COURSE CONTENT AND OUTCOME				
SL.NO	MODULE NAME	MODULE CONTENT	MODULE LEARNING OUTCOME	DURATION (HRS)
1	Introduction to Drone Technology	Basics of drones, applications in sectors like disaster management, transportation, and surveillance. Overview of DGCA rules.	Analyze the role of drones in different sectors and understand compliance requirements for drone operations.	2
2	Surveillance with Drones	Introduction to surveillance techniques, payload uses, and advanced monitoring capabilities.	Evaluate surveillance techniques and optimize payload selection for effective monitoring.	4
3	Payloads and Applications	Introduction to RGB, thermal, and hyperspectral payloads for specialized tasks.	Compare and differentiate between various payloads based on operational needs and environmental factors.	4
4	Ground Control Software	Introduction to ground control systems, waypoint mapping, and geo-tagging.	Develop software-based control mechanisms for precise drone operations.	5
5	Materials and Drone Design	Introduction to materials like carbon fiber and composites; optimizing design	Design drone frames optimized for performance under varying environmental	8

		for different terrains.	conditions.	
6	Gimbals and Camera Control	Practical sessions on gimbals, stabilization, and camera configuration for accuracy in target identification.	Evaluate gimbal systems and propose strategies to enhance camera performance during surveillance.	6
7	AI and Drone Surveys	Integration of AI for target tracking, post-processing RAW data, and practical surveillance missions.	Create AI-driven surveillance solutions for precise target identification and data processing.	15
8	Conclusion and Future Directions	Summary of course topics, future trends in drone technology, and career prospects.	Appraise the future scope of drone applications and justify career opportunities in this field.	1

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

LEARNING OUTCOME	ASSESSMENT CRITERIA	Performance Criteria	USE CASES
Understand drone types and applications	Classification of drones based on functionality.	Accurately classify drones for specific applications.	Segregate drone categories for scenarios like disaster relief or surveillance.
Appraise DGCA regulations	Knowledge of DGCA rules and certifications.	Demonstrate compliance with DGCA standards in practical tests.	Identify airspace zones and validate remote pilot

			certifications.
Evaluate payload integration techniques	Selection and usage of payloads for different purposes.	Optimize payload usage for operational scenarios.	Match payloads to tasks like agricultural mapping or thermal inspections.
Assemble and configure drones	Practical assembly and configuration of drones.	Successfully assemble drones and demonstrate flight readiness.	Build a drone with complete hardware integration and configure autopilot systems for specific tasks.
Create innovative drone-based solutions	Development of AI-integrated drone systems.	Present functional prototypes addressing specific real-world problems.	Propose AI-based solutions for challenges like traffic monitoring or environmental mapping.

TABLE 4: LIST OF FINAL PROJECTS (PROJECTS THAT COMPREHENSIVELY COVER ALL THE LEARNING OUTCOME)

SL.NO	FINAL PROJECT
1	Design and fabrication of surveillance drones
2	Thermal imaging for disaster response
3	Hyperspectral imaging for agricultural analysis
4	AI-based target tracking systems
5	Object detection using drone-integrated cameras
6	Traffic and crowd monitoring
7	Inspection and security surveillance
8	Drone-based mapping for environmental studies

9	Optimized frame design for lightweight drones
10	PID tuning for improved drone flight stability

TABLE 5: COURSE ASSESSMENT RUBRICS (TOTAL MARKS: 75)					
ASSESSMENT CRITERIA	Learning Outcome	Fair (1–5)	Good (6–10)	Excellent (11–15)	TOTAL MARKS
Knowledge of Drone Regulations	Understand and apply DGCA rules for drone operation and certification.	Limited knowledge of basic regulations.	Good understanding and application of rules in standard scenarios.	Comprehensive understanding with accurate application in complex scenarios.	15
Drone Assembly and Configuration	Demonstrate the ability to assemble and configure a functional drone.	Basic assembly with minimal configurations.	Proper assembly and partial functionality achieved.	Fully assembled drone with complete functionality and optimized configuration.	15
Practical Drone Surveillance Skills	Execute drone surveillance techniques effectively using advanced payloads.	Limited proficiency in surveillance operations.	Adequate execution of surveillance using standard payloads.	Exceptional proficiency in using advanced techniques and payloads for surveillance.	15
Ground	Program	Basic	Moderate	High-level	15

Control Software Proficiency	waypoints and operate drones using ground control software.	waypoint configuration and operation.	proficiency with minimal errors in programming.	expertise with error-free programming and operation.	
Creativity in Drone Project Development	Create innovative drone-based solutions for real-world applications.	Basic project idea with limited innovation.	Practical and moderately innovative project solution.	Highly innovative and practical project addressing complex challenges.	15