Annexure-F

Chaudhary Bansi Lal University

Hansi Road, Prem Nagar, Bhiwani

(A State University Established under Govt. of Haryana Act No 25 of 2014)

नभः स्पृशं दीप्तम्।

(Touch the sky with brilliance.)

Scheme & Syllabus
of
Post Graduate Diploma in Drone Technology

(In accordance with NEP-2020)

DEPARTMENT OF GEOGRAPHY

Approved

PGBOS&R: 15 July 2025 **Faculty Board: 02 Aug 2025**

Programme Learning Outcomes (PLO) of Diploma in Drone Technology

PLO 1	Demonstrate advanced knowledge about Drone Technology with a critical understanding of the emerging developments and issues relating to the learners domain area.
PLO 2	Demonstrate advanced knowledge and understanding of principles, methods, and techniques applicable to the chosen field of study.
PLO 3	Demonstrate the capacity to extrapolate the acquired knowledge and skills to real-life situations and apply acquired competencies in new/unfamiliar contexts.
PLO 4	Demonstrate the ability to apply the acquired conceptual, operational or technical knowledge and a range of cognitive and practical skills to identify and address problems related to the chosen field of learning.
PLO 5	Demonstrate the apply advanced knowledge relating to research methods to carryout research and investigations to formulate evidence-based solutions to complex and unpredictable problems in the field of Drone Technology.
PLO 6	Demonstrate the ability to communicate, in a well-structured manner the findings/ results of the research studies undertaken in the field of Drone Technology.
PLO 7	Pursue self-paced and self- directed learning to upgrade knowledge and skills, including research-related skills avoiding unethical practices.

Chaudhary Bansi Lal University

Scheme of Examination and Syllabus for Post Graduate Diploma in Drone Technology (w.e.f. 2025-26)

Semester	Course Type	Course Code	Nomenclature of the Paper	Credits	Hours/Week	External Assessment Marks	Internal Assessment Marks	Total Marks	Duration of Exam.
I	CC-1	25PGDDT-101	Introduction to Drone Technology	4	4	70	30	100	3 Hours
	CC-2	25PGDDT-102	Flight Principles and Planning	4	4	70	30	100	3 Hours
	CC-3	25PGDDT-103	Drone Hardware & Electronics	4	4	70	30	100	3 Hours
	CC-4	25PGDDT-104	Drone Operations and Pilot Training (Practical)	4	8	70	30	100	3 Hours
	DEC - 1	25PGDDT-105	Drone Applications in Agriculture and Precision Farming	4	4	70	30	100	3 Hours
		25PGDDT-106	Drones Application in Disaster Management and Emergency Response						
		25PGDDT-107	MOOC/SWAYAM						
II	CC-5	25PGDDT-201	Remote Sensing and GIS Basics	4	4	70	30	100	3 Hours
	CC-6	25PGDDT-202	Drone Data Acquisition and Processing	4	4	70	30	100	3 Hours
	CC-7	25PGDDT-203	Drone Laws and Regulations	4	4	70	30	100	3 Hours
	CC-8	25PGDDT-204	Project Report/Industrial Apprentice	4	8	70	30	100	3 Hours
	DEC-2	25PGDDT-205	Urban and Regional Planning with Drones	4	4	70	30	100	3 Hours
		25PGDDT-206	Surveying and Land Records Management with UAVs						
		25PGDDT-207	MOOC/SWAYAM						
	VAC	25PGDDT-208	Drone Entrepreneurship & Start-up Essentials	2	2	35	15	50	3 Hours

CC-01			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	I		
Name of the Course	Introduction to Drone Technology		
Course Code	25PGDDT-101		
Course Type	CC-01		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand the classifications, components, and aerodynamics of UAV systems. 2. Analyze drone flight mechanisms, control systems, and communication technologies. 3. Apply relevant drone regulations and demonstrate ethical and safe drone operations. 4. Evaluate the utility of drones across multiple sectors and simulate basic UAV missions.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course-learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	1. Introduction to UAVs: History, evolution, and classifications (fixed-wing, rotary-wing, VTOL, hybrid). 2. Components of drones: airframe, propulsion system (motors, ESCs, propellers), power systems (batteries, power distribution).	15
II	3. Principles of flight: Lift, drag, thrust, and weight; stability and control. 4. Drone control systems: Flight controllers (ArduPilot, PX4), PID control basics, autonomous vs manual control.	16
III	5. Sensors and communication: GPS, IMU, barometer, compass, LiDAR, camera modules; telemetry, data links, ground control stations. 6. Drone navigation and simulation: Waypoint-based missions, mission planning software (QGroundControl, Mission Planner), introduction to simulation platforms.	14

IV	7. UAV regulations and airspace: DGCA rules, NPNT, no-fly zones, global regulatory bodies (FAA, EASA), ethical issues in drone use. 8. Applications of drones: Use cases in agriculture, mapping, surveillance, disaster management, logistics; trends in swarm technology and AI in drones.	15
Total Contact Hours		60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Theory	30	➢ Theory	70
○ Class Participation:	05	Written Examination:70	
○ Seminar/presentation/assignment/quiz/class test etc.:	10		
○ Mid-Term Exam:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Austin, R. (2010). *Unmanned Aircraft Systems: UAV Design, Development, and Deployment*. Wiley.
2. Beard, R., & McLain, T. (2012). *Small Unmanned Aircraft: Theory and Practice*. Princeton University Press.
3. Mahalik, N.P. (2003). *Mechatronics: Principles, Concepts and Applications*. McGraw-Hill.
4. Apuroop, R. (2022). *Drone Technology Handbook*. BPB Publications.

E-resources:

- **ArduPilot Docs**
- **PX4 Documentation**
- **DGCA India - UAS Guidelines**

CC-02			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	I		
Name of the Course	Flight Principles and Planning		
Course Code	25PGDDT-102		
Course Type	CC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand aerodynamic principles governing UAV flight, including the four forces and airfoil behavior. 2. Analyze stability and control characteristics of both multirotor and fixed-wing UAV configurations. 3. Apply performance calculations to assess mission feasibility, considering payload, endurance, and environmental factors. 4. Create comprehensive flight plans using industry-standard mission planning tools, incorporating safety and regulatory constraints.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course-learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	1. Aerodynamic forces: lift, drag, thrust, weight 2. Airfoil characteristics: camber, aspect ratio, Reynolds number effects.	15
II	3. Static and dynamic stability (longitudinal, lateral, directional) 4. Control surfaces and control allocation in multirotor and fixed-wing UAVs	16

III	5. Performance metrics: climb rate, glide ratio, endurance, range 6. Mission requirements: payload vs performance trade-offs, environmental effects	14
IV	7. Pre-flight planning: waypoints, flight envelopes, no-fly zones, risk assessment 8. Use of mission planning software (QGroundControl, Mission Planner), emergency procedures, data logging	15
Total Contact Hours		60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Theory	30	➢ Theory	70
o Class Participation:	05	Written Examination:70	
o Seminar/presentation/assignment/quiz/class test etc.:	10		
o Mid-Term Exam:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Anderson, J. D. (2010). *Fundamentals of Aerodynamics* (5th ed.). McGraw-Hill.
2. Beard, R. W., & McLain, T. W. (2012). *Small Unmanned Aircraft: Theory and Practice*. Princeton University Press.
3. Austin, R. (2010). *Unmanned Aircraft Systems: UAV Design, Development and Deployment*. Wiley.
4. McCormick, B. W. (1995). *Aerodynamics, Aeronautics, and Flight Mechanics*. Wiley.
5. Stevens, B. L., & Lewis, F. L. (2003). *Aircraft Control and Simulation* (2nd ed.). Wiley.

Online Resources:

- NASA Glenn Research Center Aerodynamics Portal
- MIT OCW: *Unified Engineering - Aerodynamics*
- NPTEL: *Introduction to Flight*

CC-3			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	I		
Name of the Course	Drone Hardware & Electronics		
Course Code	25PGDDT-103		
Course Type	CC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand the structure and working principles of drone mechanical and electronic systems. 2. Identify and evaluate key electronic components used in UAV systems. 3. Analyze flight controller functions and sensor integration for navigation and stability. 4. Apply diagnostics and system-level integration for efficient drone hardware operation.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course-learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	1. Overview of Drone Systems: Types (fixed-wing, multirotor, hybrid), components and architecture. 2. Drone frames and mechanical design: Materials (carbon fiber, plastic, aluminum), frame types, structural stress.	15
II	3. Power and Propulsion Systems: Motors (brushed vs brushless), ESCs, propellers, LiPo batteries, power distribution boards. 4. Efficiency, thrust-to-weight ratio, battery management and charging protocols.	16
III	5. Flight Controllers and Sensors: Working principles of IMU, gyroscope, accelerometer, magnetometer, barometer, GPS modules. 6. Flight controller firmware: ArduPilot, PX4, Betaflight—configuration and tuning basics.	14

IV	7. Communication & Telemetry: RC transmitters/receivers, telemetry radios, FPV systems, ground control stations (GCS), MAVLink protocol. 8. Integration and Troubleshooting: Signal routing, noise filtering, EMI issues, calibration and diagnostics.	15
Total Contact Hours		60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Theory	30	➢ Theory	70
○ Class Participation:	05	Written Examination:70	
○ Seminar/presentation/assignment/quiz/class test etc.:	10		
○ Mid-Term Exam:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Barnhart, R., Hottman, S., & Marshall, D. (2019). *Introduction to Unmanned Aircraft Systems* (3rd ed.). CRC Press.
2. Apuroop, R. (2022). *Drone Technology Handbook*. BPB Publications.
3. Austin, R. (2010). *Unmanned Aircraft Systems: UAVS Design, Development and Deployment*. Wiley.

E-resources:

- ArduPilot Documentation: https://ardupilot.org
- PX4 Autopilot Documentation: https://docs.px4.io
- DJI SDK & Hardware Manuals
- Data sheets of ESCs, LiPo batteries, GPS, and IMUs

CC-4			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	I		
Name of the Course	Drone Operations and Pilot Training (Practical)		
Course Code	25PGDDT-104		
Course Type	CC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand the basic principles of remote sensing and its physical foundations. 2. Interpret satellite imagery and apply digital image processing techniques. 3. Explain GIS data structures and perform basic spatial data handling and analysis. 4. Evaluate the use of RS and GIS technologies in real-world applications and decision-making.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter:

Note: The examiner shall set six questions. Students are required to attempt any four questions.

Distribution of Marks for Evaluation

Exercise = l0x4=40 **File Record = 10** **Viva-voce : 20**

Unit	Topics	Contact Hours
I	1. Introduction to drone hardware and safety procedures. 2. Assembling and calibrating UAV components: ESCs, propellers, GPS, IMU, compass.	30
II	3. Pre-flight checklist and standard operating procedures (SOPs). 4. Basic manual flying skills (takeoff, hover, yaw, pitch, roll, landing).	30

III	5. Waypoint navigation, return-to-home (RTH), and flight automation using GCS (Mission Planner, QGroundControl). 6. Troubleshooting in field conditions.	30
IV	7. Simulated flight training on platforms like DJI Simulator, RealFlight, or open-source SITL. 8. Emergency procedures: Failsafe, loss of GPS/RC link, battery emergencies.	30
Total Contact Hours		120

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Practicum	30	➢ Practicum	70
o Class Participation:	05	Written Examination: 70	
o Seminar/presentation/assignment/quiz/practical record etc.:	10		
o Field/Lab Performances:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Barnes, D. (2021). *Become a Drone Pilot: 2023 Edition*. UAS Training Publications.
2. Apuroop, R. (2022). *Drone Technology Handbook*. BPB Publications.
3. Beard, R. & McLain, T. (2012). *Small Unmanned Aircraft: Theory and Practice*. Princeton University Press.

E-resources:

i. DGCA India – *Drone Flying Manual & Civil Aviation Requirements (CAR) for RPAS*.
ii. ArduPilot/PX4 – *Flight Controller Setup and Safety Guidelines*.
iii. *Pilot Training Manual and Flight Checklist*.

DEC-1			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	I		
Name of the Course	Drone Applications in Agriculture and Precision Farming		
Course Code	25PGDDT-105		
Course Type	DEC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand the concepts of precision agriculture and the strategic role of drones. 2. Identify and evaluate drone sensors and payloads suitable for agricultural applications. 3. Analyze geospatial data to assess crop health, water stress, and yield estimation. 4. Apply drone-based techniques for agricultural spraying, monitoring, and decision support.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course-learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	1. Introduction to Precision Agriculture: Concepts, evolution, and objectives. 2. Role of drones in agriculture: Benefits, limitations, and comparison with conventional methods.	15
II	3. Types of drones used in agriculture: Multispectral, hyperspectral, RGB, thermal imaging. 4. Drone payloads and sensors: Camera specs, data types, integration with UAV platforms..	15

III	5. Data acquisition and processing: Mission planning, image stitching, orthomosaics, NDVI, SAVI, and vegetation indices. 6. Applications: Crop monitoring, pest and disease detection, yield estimation, irrigation management.	15
IV	7. Spraying drones: Working principles, flow rate, droplet size, tank capacity, calibration, safety measures. 8. Regulations, case studies, and future trends: DGCA guidelines for agri-drones, digital agriculture initiatives, AI and IoT integration.	15
Total Contact Hours		60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Theory	30	➢ Theory	70
o Class Participation:	05	Written Examination: 70	
o Seminar/presentation/assignment/quiz/class test etc.:	10		
o Mid-Term Exam:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Zhang, C., & Kovacs, J. M. (2012). *The application of small UAVs for precision agriculture: A review*. Precision Agriculture.
2. Mulla, D. J. (2013). *Twenty five years of remote sensing in precision agriculture: Key advances and remaining knowledge gaps*. Biosystems Engineering.
3. Apuroop, R. (2022). *Drone Technology Handbook*. BPB Publications.

E-resources:

- FAO. (2021). *E-agriculture in action: Drones for agriculture*.
- DGCA India – *CAR Guidelines for RPAS in Agriculture.*
- ICAR Report – *Use of Unmanned Aerial Vehicles in Indian Agriculture.*
- NPTEL: *Remote Sensing and Agriculture Applications*
- ISRO IIRS: *Drone Applications in Agriculture*
- Pix4D & DroneDeploy: *Case studies and agri-mapping tutorials*
- YouTube Channels: *DJI Agriculture, AgEagle, Sentera*

DEC-1			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	I		
Name of the Course	Drones Application in Disaster Management and Emergency Response		
Course Code	25PGDDT-106		
Course Type	DEC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand disaster types and the role of drone-based remote sensing in managing emergencies. 2. Evaluate drone platforms and payload configurations for different disaster scenarios. 3. Analyze drone-acquired data for real-time decision-making and post-disaster assessment. 4. Apply drones in disaster planning, response coordination, and delivery of critical services.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course-learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	1. Introduction to Disaster Management: Types of disasters (natural and man-made), disaster phases (mitigation, preparedness, response, recovery). 2. Role of geospatial technologies in disaster management: GIS, Remote Sensing, and UAV synergy.	15
II	3. Drone platforms and payloads for disaster applications: Multispectral, thermal, LiDAR, HD video, loudspeaker modules, medical payloads. 4. Real-time mapping and situational awareness: Live feeds, orthomosaics, point clouds, and 3D modelling for response teams.	15

III	5. Use cases in different disasters: Floods, Earthquakes, Forest fires, Cyclones & landslides. 6. Integration with emergency response systems: Coordination with NDRF, SDRF, military, and NGOs.	15
IV	7. Policy, safety and ethical issues: DGCA regulations, data privacy, SOPs, BVLOS and NPNT compliance. 8. Case studies and future trends: AI integration, drone swarms, international best practices.	15
Total Contact Hours		60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Theory	30	➢ Theory	70
o Class Participation:	05	Written Examination: 70	
o Seminar/presentation/assignment/quiz/class test etc.:	10		
o Mid-Term Exam:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Adams, S. M., & Friedland, C. J. (2011). A survey of unmanned aerial vehicle (UAV) usage for imagery collection in disaster research and management.
2. Alexander, D. (2002). *Principles of Emergency Planning and Management*. Oxford University Press.
3. Chou, J. S., et al. (2020). Post-disaster assessment using UAVs and deep learning for structural damage detection.
4. FAO & ITU. (2017). *Drones in Humanitarian Action: A Guide to the Use of Airborne Systems in Humanitarian Crises*.
5. Meier, P. (2015). *Digital Humanitarians: How Big Data Is Changing the Face of Humanitarian Response*. CRC Press.
6. NDMA India – *Guidelines for Disaster Management and UAV Use in Emergencies*.

E-resources:

- **UN-SPIDER**: *Knowledge Portal for Space-Based Disaster Response*
- **DJI Enterprise**: *Emergency drone response case studies*
- **DroneSAR**: *Software for live search & rescue coordination*

CC-05			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	II		
Name of the Course	Remote Sensing and GIS Basics		
Course Code	25PGDDT-201		
Course Type	CC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand the basic principles of remote sensing and its physical foundations. 2. Interpret satellite imagery and apply digital image processing techniques. 3. Explain GIS data structures and perform basic spatial data handling and analysis. 4. Evaluate the use of RS and GIS technologies in real-world applications and decision-making.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course-learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	1. Fundamentals of Remote Sensing: Definition, historical development, stages, electromagnetic spectrum. 2. Platforms and sensors: Types of orbits, satellites (Landsat, IRS, Sentinel), sensor types (optical, thermal, microwave).	15
II	3. Image Interpretation and Analysis: Elements of visual interpretation, digital image processing, image enhancement, 4. Image rectification, georeferencing, classification techniques (supervised & unsupervised).	15

III	5. GIS Fundamentals: Components of GIS, data types (spatial and attribute), data models (raster and vector), map projections, coordinate systems. 6. Data input and editing: Digitization, topology creation, attribute data handling.	15
IV	7. GIS Operations: Overlay analysis, buffering, spatial querying, interpolation, network analysis. 8. Applications of RS & GIS in resource management, urban planning, disaster management, agriculture, environment monitoring.	15
Total Contact Hours		60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Theory	30	➢ Theory	70
o Class Participation:	05	Written Examination: 70	
o Seminar/presentation/assignment/quiz/class test etc.:	10		
o Mid-Term Exam:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Lillesand, T. M., Kiefer, R. W., & Chipman, J. (2015). *Remote Sensing and Image Interpretation* (7th ed.). Wiley.
2. Burrough, P. A., & McDonnell, R. A. (1998). *Principles of Geographical Information Systems*. Oxford University Press.
3. Jensen, J. R. (2007). *Remote Sensing of the Environment: An Earth Resource Perspective*. Pearson.
4. Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). *Geographic Information Systems and Science*. Wiley.

E-resources:

- ISRO's IIRS E-learning platform
- NPTEL Course: *Remote Sensing and GIS*
- ESRI Academy (https://www.esri.com/training/)
- NASA ARSET Training Modules

CC-6			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	II		
Name of the Course	Drone Data Acquisition and Processing		
Course Code	25PGDDT-202		
Course Type	CC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand the planning and execution process of drone-based data acquisition missions. 2. Identify and configure sensors and data capture parameters suitable for specific applications. 3. Process and analyze geospatial data using commercial and open-source software tools. 4. Evaluate data quality, accuracy, and applicability for decision-making in mapping projects.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course-learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	1. Fundamentals of drone-based data acquisition: Flight planning, mission parameters, ground control points (GCPs), overlap and sidelap concepts. 2. 2. Types of sensors and data: RGB, multispectral, thermal, LiDAR — characteristics and data output formats.	15
II	3. Image acquisition techniques: Pre-flight checks, flight execution using GCS (Mission Planner, Pix4D Capture, DJI GS Pro). 4. Data logging and retrieval: Telemetry, metadata, onboard storage, cloud sync.	16

III	5. Data preprocessing: Radiometric and geometric corrections, orthorectification, georeferencing, stitching images to create orthomosaics and point clouds. 6. Use of software tools: Pix4D, Agisoft Metashape, DJI Terra, QGIS basics.	14
IV	7. Analysis and interpretation: Generation of NDVI etc., DSM/DTM, contours, volumetric analysis. 8. Accuracy assessment, error sources, validation with field data, integration with GIS platforms.	15
Total Contact Hours		60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Theory	30	➢ Theory	70
○ Class Participation:	05	Written Examination:70	
○ Seminar/presentation/assignment/quiz/class test etc.:	10		
○ Mid-Term Exam:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Lillesand, T. M., & Kiefer, R. W. (2015). *Remote Sensing and Image Interpretation* (7th Ed.). Wiley.
2. Jensen, J. R. (2007). *Remote Sensing of the Environment: An Earth Resource Perspective*. Pearson.
3. Apuroop, R. (2022). *Drone Technology Handbook*. BPB Publications.

Online Resources:

- Pix4D Documentation: https://support.pix4d.com
- Agisoft Metashape Tutorials: https://www.agisoft.com
- QGIS User Manual: https://docs.qgis.org

CC-7			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	II		
Name of the Course	Drone Laws and Regulations		
Course Code	25PGDDT-203		
Course Type	CC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand national and international drone classifications, regulatory frameworks, and policies. 2. Apply DGCA rules for drone operation, licensing, and digital sky platform use in India. 3. Evaluate legal, ethical, and privacy issues associated with commercial drone deployment. 4. Analyze the operational responsibilities and compliance mechanisms for drone pilots and firms..		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course-learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	1. Introduction to UAV/Drone Classification and Terminology: Nano, Micro, Small, Medium, Large categories. 2. Evolution of UAV regulations: Global overview (ICAO, FAA, EASA) and Indian context.	15
II	3. DGCA Drone Rules 2021 (India): Registration, certification, operation zones, remote pilot license, digital sky platform. 4. No Permission No Takeoff (NPNT), Geo-fencing, Green/Yellow/Red Zones.	15

III	5. Guidelines for commercial drone use: Aerial mapping, surveillance, agriculture, deliveries, and BVLOS trials. 6. Roles of government agencies: DGCA, MoCA, MHA, ISRO, AAI, state authorities.	15
IV	7. Safety, privacy, and legal concerns: Data protection, liability, cyber security, insurance, anti-drone systems. 8. Case laws, drone-related incidents, international best practices, and emerging policies.	15
Total Contact Hours		60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Theory	30	➢ Theory	70
o Class Participation:	05	Written Examination: 70	
o Seminar/presentation/assignment/quiz/class test etc.:	10		
o Mid-Term Exam:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Paul McBride (2017). *Drone Law and Regulation*. Routledge.
2. Brendan Schulman & Lisa Ellman. *Drone Law and Policy (U.S. and Global Perspectives)* — White papers.

Regulations:

- **DGCA India** – Drone Rules, 2021 (latest amendments)
- **Ministry of Civil Aviation (MoCA)** – Drone Import Policy & UAS Policy Roadmap
- **Digital Sky Platform User Manual** – https://digitalsky.dgca.gov.in
- **ICAO Manual on Remotely Piloted Aircraft Systems (RPAS)**
- **FAA (USA)** – Part 107 Drone Regulations
- **EASA (Europe)** – UAS Regulations

CC-8			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	I		
Name of the Course	Project Report/Industrial Apprentice (Practical)		
Course Code	25PGDDT-204		
Course Type	CC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Identify a real-world problem and design an appropriate UAV-based project proposal. 2. Conduct field-level drone operations and collect relevant technical data. 3. Analyze and process acquired data using appropriate software and techniques. 4. Prepare a comprehensive technical report and present project findings with clarity.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	**3 hours**		
Part B- Contents of the Course			
Distribution of Marks for Evaluation **Project / Industrial Apprentice Report= 50** **Viva-voce : 20**			
Guidelines			

Objectives: *To provide hands-on exposure to real-world drone-based applications through a structured internship or industry/research project, and to enable students to synthesize their learning into a formal project report.*

Project/Internship Types

Students may choose one of the following:

1. **Industry Internship** (e.g., in UAV firms, GIS/RS companies, disaster management agencies, agriculture tech companies)
2. **Research Project** (e.g., under academic supervision, in applied domains like precision agriculture, environmental monitoring, or AI-enabled drone navigation etc..)
3. **Field-based Independent Study** (approved by the department)

Brief Outline for the Project Report	
Section	**Details**
Title Page	Project title, student name, enrollment number, institution, guide, date
Declaration	Student's declaration of originality
Certificate	Internship certificate from industry/guide (if applicable)
Acknowledgement	Appreciation for guidance and support
Abstract	Summary of objectives, methodology, and key findings (300–400 words)
Table of Contents	With page numbers
Chapter 1	Introduction (Background, significance, objectives, scope)
Chapter 2	Literature Review (Key references related to the concept, topic and techniques)
Chapter 3	Methodology (Data Source & Equipment used (drones, sensors, software), workflow, data collection steps etc)
Chapter 4	Results & Analysis (Data interpretation, graphs, tables, maps, and discussion)
Chapter 5	Conclusions (Findings, limitations, and recommendations for future work)
References	Standard citation style (APA/IEEE/MLA)
Appendices	Raw data, flight logs, permissions, code, additional visuals

Suggested Evaluation Methods			
Internal Assessment: 30		**End Term Examination: 70**	
➢ Practicum	30	➢ Practicum	70
o Participation:	05	Project / Industrial Apprentice Report= 50 Viva-voce : 20	
o Seminar/presentation/assignment/quiz/class test etc.:	10		
o Field/Lab Performances:	15		

DEC-2			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	II		
Name of the Course	Urban and Regional Planning with Drones		
Course Code	25PGDDT-205		
Course Type	DEC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand the key principles of urban and regional planning and their geospatial dimensions. 2. Design and execute drone-based surveys for urban and peri-urban data collection 3. Analyze and interpret urban spatial data for planning and infrastructure management. 4. Evaluate the use of UAVs for sustainable urban development and smart city initiatives.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course-learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	1. Overview of Urban and Regional Planning concepts: land use planning, zoning, master plans. 2. Role of geospatial technologies and UAVs in urban infrastructure mapping and planning.	15
II	3. Drone-based data acquisition for urban environments: orthophotos, digital surface models (DSM), 3D modeling. 4. UAV mission planning in urban areas: flight restrictions, airspace concerns, safety, and line-of-sight issues.	15

III	5. Urban land use/land cover mapping, change detection, and encroachment monitoring using UAV data. 6. Integration of drone imagery with GIS for spatial analysis: transportation networks, utilities, and green infrastructure.	15
IV	7. Regional planning applications: Smart cities, peri-urban monitoring, flood risk zones, disaster-resilient infrastructure planning. 8. Case studies: UAV use in slum mapping, urban sprawl analysis, and infrastructure audit.	15
Total Contact Hours		60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Theory	30	➢ Theory	70
o Class Participation:	05	Written Examination: 70	
o Seminar/presentation/assignment/quiz/class test etc.:	10		
o Mid-Term Exam:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. LeGates, R. T. & Stout, F. (2015). *The City Reader*, Routledge.
2. Hall, P. (2014). *Cities of Tomorrow: An Intellectual History of Urban Planning*, Wiley-Blackwell.
3. Jensen, J. R. (2007). *Remote Sensing of the Environment*, Pearson.
4. Kumar, S. & Rana, A. (2022). *Urban Mapping Using Drones*, CRC Press.

DEC-2			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	II		
Name of the Course	Surveying and Land Records Management with UAVs		
Course Code	25PGDDT-206		
Course Type	DEC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand land surveying principles and modern methods including UAV-based mapping. 2. Conduct UAV-based cadastral and topographic surveys with appropriate tools and techniques. 3. Process drone-acquired spatial data for high-accuracy land record mapping and management. 4. Evaluate integration of UAV surveying with GIS and digital land record systems.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course-learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	1. Fundamentals of land surveying: principles, tools, and techniques (traditional & modern). 2. Basics of cadastral mapping and land records management in India (BhuNaksha, SVAMITVA, etc.).	15
II	3. UAV platforms for surveying: RTK/PPK drones, GCPs, sensors (RGB, LiDAR). 4. Mission planning for cadastral and topographic surveys: accuracy, resolution, overlap, and flight safety.	15

III	5. UAV data acquisition and processing: orthomosaic generation, DSM/DTM, contour mapping, and boundary delineation. 6. Post-processing workflows: geo-referencing, error correction, accuracy assessment.	15
IV	7. Integration with GIS and land record systems: updating cadastral maps, parcel management, and property tax mapping. 8. Case studies: SVAMITVA scheme, drone-based titling, village mapping and e-governance initiatives.	15
Total Contact Hours		60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Theory	30	➢ Theory	70
o Class Participation:	05	Written Examination: 70	
o Seminar/presentation/assignment/quiz/class test etc.:	10		
o Mid-Term Exam:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Ghilani, C. D. (2018). *Elementary Surveying: An Introduction to Geomatics*, Pearson.
2. Wolf, P. R. & Dewitt, B. A. (2013). *Elements of Photogrammetry*, McGraw Hill.
3. Roy, S. & Rao, P. S. (2022). *Drone Surveying and Mapping*, NIPA Publications.
4. Government of India (MoRD). *SVAMITVA Scheme Guidelines & Technical Manual*.

E-resources:

- BhuNaksha – Cadastral mapping and land parcel digitization
- e-Governance Portals – Bhoomi (Karnataka), Bhulekh (UP), etc.
- SVAMITVA (Survey of Villages and Mapping with Improvised Technology in Village Areas), MoRD
- NRSC/ISRO – Use of UAVs in land record modernization

VAC			
Session: 2025-26			
Part A - Introduction			
Name of Programme	PG Diploma in Drone Technology		
Semester	II		
Name of the Course	Drone Entrepreneurship & Start-up Essentials		
Course Code	25PGDT-208		
Course Type	VAC		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand the structure and trends of the drone industry and identify potential market gaps. . 2. Apply startup development principles including lean canvas, MVP, and pitch creation to drone ventures. . 3. Analyze business models, legal compliance, and funding sources relevant to drone entrepreneurship. 4. Design a drone-based solution with viable go-to-market strategy for a chosen domain.		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner shall set five questions, including two questions from each unit, taking into consideration the Course Learning Outcomes (CLOs). In addition, one compulsory question (Question No. 1) shall be included, consisting of seven short parts that collectively cover the entire syllabus. The examinee will be required to attempt three questions in total: one question from each of the selected units and the compulsory Question No. 1. The compulsory question will carry 07 marks, while each long-answer question will carry 14 marks (each).

Unit	Topics	Contact Hours
I	1. Global and Indian UAV industry trends, Key players, use cases (AgriTech, InfraTech, HealthTech, Defense) 2. Design Thinking, Problem-Solution Fit, Lean Start-up and Business Model Canvas, Identifying drone-based market opportunities	15

II	3. DGCA/UAS Rules 2021: licensing, import, compliance, Company registration, IP & licensing basics, Drone-specific insurance, risk, and safety SOPs 4. Government schemes: Drone Shakti, Startup India, SIDBI, iDEX, Pitch deck preparation, investor expectations, Incubators, accelerators, and drone clusters (Drone Didi, Garuda Aerospace case study)	15
Total Contact Hours		30

Suggested Evaluation Methods

Internal Assessment: 15		**End Term Examination: 35**	
➢ Theory	15	➢ Theory	35
○ Class Participation:	04	Written Examination: 35	
○ Seminar/presentation/assignment/quiz/class test etc.:	04		
○ Mid-Term Exam:	07		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Apuroop, R. (2022). *Drone technology handbook*. BPB Publications.
2. Maurya, A. (2012). *Running lean: Iterate from plan A to a plan that works* (2nd ed.). O'Reilly Media.
3. Ries, E. (2011). *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*. Crown Business.
4. Government of India. (n.d.). *Startup India learning and development program toolkit*. Startup India. https://www.startupindia.gov.in/
5. Directorate General of Civil Aviation (DGCA). (2021). *Drone rules, 2021*. Ministry of Civil Aviation, Government of India. https://www.dgca.gov.in
6. Drone Federation of India. (2022). *Drone industry vision 2030: Roadmap to make India the drone hub of the world*. https://dronefederation.in
7. EY–FICCI. (2022). *Making India the drone hub of the world*. Federation of Indian Chambers of Commerce and Industry. https://ficci.in
8. NITI Aayog. (2021). *Opportunities in Indian drone ecosystem*. Government of India. https://niti.gov.in
9. Drone Federation of India. (n.d.). *Webinars & policy briefings*. https://dronefederation.in