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SIDDHARTHA ENGINEERING COLLEGE
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VIJAYAWADA-520007
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

REPORT ON DRONE WORKSHOP

The Department of Electrical and Electronics Engineering conducted a four-day workshop on Drone Dynamics and flying in association with Garuda Aerospace, Chennai, from 09-11-2024 to 12-11-2024. The students actively participated in the workshop, which made it successful.

Convener:

Dr. P. V. R. L. Narasimham
Professor and HOD, EEE Department, VRSEC

Coordinator:

Dr. Vimala kumari J
Assistant Professor, EEE Department, VRSEC

This report encapsulates the essence of the Drone Dynamics and Drone Flying workshop, highlighting its objectives, key highlights, and the impact it aims to make in drone technology.

Workshop Report: Drone Dynamics and Drone Flying

Date

09/11/2024 – 12/11/2024

Venue

Room No – 210B, EEE Department

Participants

VRSEC Students from EEE, ECE and Mechanical.

Introduction:

The workshop on **Drone Dynamics and Drone Flying** was successfully conducted to provide participants with an in-depth understanding of the principles of drone dynamics. The program offered a blend of theoretical knowledge and practical experience, covering key topics such as:

- The fundamentals of drone dynamics.
- Simulation techniques for drone flying.
- Real-time hands-on sessions on drone flying.

This comprehensive approach allowed participants to gain valuable insights into the operation and control of drones, enhancing their technical skills and understanding of UAV technology.

Workshop Agenda:

1. Introduction to Garuda Aerospace and Drone
2. Basic Flight Principles
3. Drone Systems and Components
4. Preflight Preparation
5. Flight Operations
6. Basic Principles of Flight & Rotorcraft Operations and Aerodynamics
7. Anatomy of Agri Drones
8. Simulation practice
9. Flying Practice
10. Maintenance Operations & Hands-on training

Key Highlights:

Day-1:

1. Introduction to Garuda Aerospace and Drone:

The workshop began with an overview of Garuda Aerospace, Garuda Aerospace is a leading Indian drone manufacturing company specializing in cutting-edge drone solutions for various industries. Founded in 2015, Garuda Aerospace specializes in designing cutting-edge drones tailored to specific applications such as:

- **Agriculture** – Crop spraying and precision mapping.
- **Defense** – Surveillance and tactical operations.
- **Infrastructure** – Monitoring and inspection.
- **Disaster Management** – Rapid response and relief efforts.

The company is committed to advancing drone technology for sustainable and efficient solutions.

2. Basic Flight Principles:

Drones operate using the principles of lift, thrust, weight, and drag. The spinning propellers generate lift to counteract gravity and thrust to move the drone in different directions. Adjusting the speed of individual motors controls the drone's pitch, roll, yaw, and altitude. A stable flight is achieved through precise electronic controls and sensors like gyroscopes and accelerometers.



Fig. 1

3. Drone Systems and Components:

Drone systems consist of unmanned aerial vehicles (UAVs) equipped with components for navigation, control, and payload functionality. Key components include the airframe, propulsion system (motors and propellers), flight controller (the brain of the drone), and communication systems (remote controllers or autonomous systems). Sensors like GPS, cameras, and LiDAR enhance capabilities such as stability, navigation, and data collection. Power is supplied by batteries, with additional features like obstacle avoidance or thermal imaging depending on the drone's application.

Day-2:

4. Preflight Preparation:

Pre-flight preparation for drones involves checking the drone's physical condition, including its motors, propellers, and battery. It also includes ensuring software updates are installed and verifying GPS functionality. The operator must confirm compliance with regulations and airspace restrictions. Finally, performing a system check guarantees all equipment functions properly for safe and efficient flight.



Fig. 2

5. Flight Operations:

Flight operations of drones involve planning and executing controlled flights to achieve specific tasks, such as mapping, surveying, or photography. Operators must ensure the drone is in optimal condition, adhere to safety protocols, and monitor the flight in real-time. Compliance with local regulations, such as no-fly zones and altitude limits, is essential. Post-flight, data is reviewed, and the drone is inspected for any maintenance needs.

Day-3:

6. Basic Principles of Flight & Rotorcraft operations and Aerodynamics:

The basic principles of flight involve the four forces: lift, weight, thrust, and drag, which work together to control an aircraft's motion. Rotorcraft, such as helicopters and drones, generate lift through rotating blades that push air downwards, creating upward thrust. Aerodynamics governs how air interacts with the craft, with factors like airspeed, angle of attack, and wing shape influencing flight efficiency. Thrust propels the craft forward, while drag resists this motion. Understanding these principles ensures effective control, stability, and performance in flight operations.

7. Anatomy of Agri Drones:

Agri drones consist of several key components: the frame, which provides structural support; motors and propellers for lift and movement; sensors for gathering data, such as cameras, thermal, and multispectral sensors; a GPS for precise navigation and mapping; and a battery that powers the drone. These drones are designed to collect data on crop health, soil conditions, and other agricultural factors, helping farmers optimize their operations. Additionally, they often feature a spraying mechanism for pesticide or fertilizer application. Together, these parts allow Agri drones to enhance efficiency and productivity in modern farming.

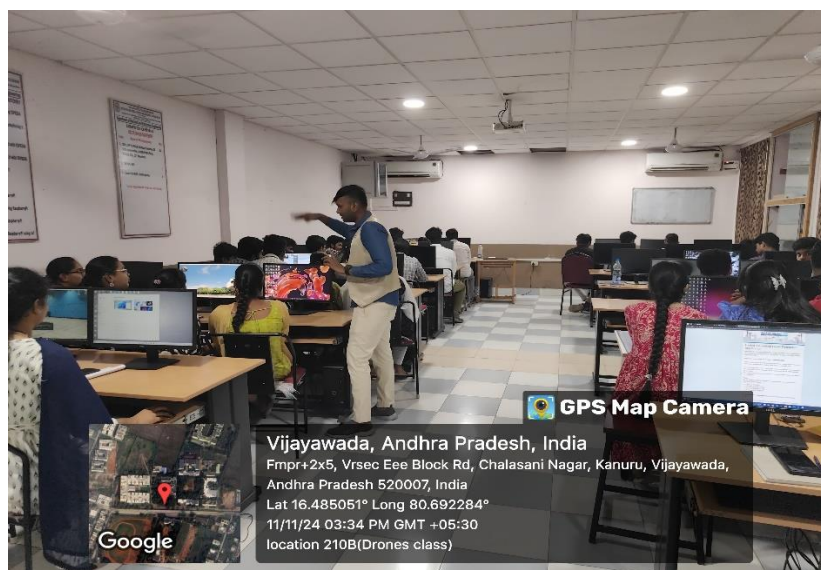


Fig. 3

Day-4:

8. Maintenance Operations & Hands-on training:

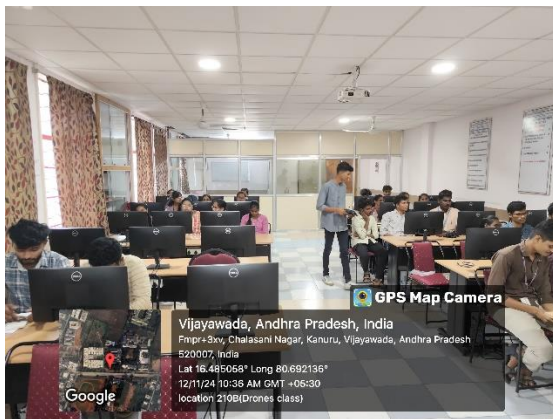


Fig. 4

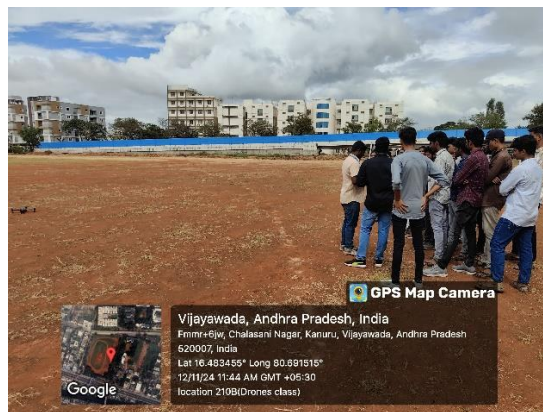


Fig. 5



Fig. 6

Conclusion:

The workshop on Drone Dynamics and Drone Flying provided participants with a comprehensive understanding of Drone Dynamics and equipped them with practical skills on Drone Flying. The hands-on experience and interactive sessions ensured an engaging learning experience for all participants.



Fig. 7