



**JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY**  
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(Established by H.P. State Legislature vide Act No. 14 of 2002)



## Sky Circuit – Saturnalia 2025

At

**Thapar Institute of Engineering & Technology, Patiala**



One team comprising **Sambhav Thakur (221040001)** and **Parth Gupta (221040005)** of **Electronics and Communication Engineering (ECE)** Department, JUIT participated in **Sky Circuit**, a Line-of-Sight (LOS) drone obstacle course event conducted during *Saturnalia 2025* at Thapar Institute of Engineering & Technology, Patiala on November 15-16, 2025. The event provided significant academic and technical exposure, enabling participants to explore modern developments in drone technology, racing dynamics, and UAV engineering practices.

Sky Circuit featured two event categories based on frame dimensions: **sub-10-inch FPV drones** and **above-10-inch performance drones**. The team competed in the above-10-inch category, where most institutions deployed advanced FPV setups integrated with:

- 16-inch carbon-fiber frames,



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- High-KV brushless motors for rapid throttle response,
- F4/F7 flight controllers supporting sophisticated PID control and gyro-filtering,
- BLHeli-32 ESC stacks for efficient power modulation,
- Stacks FC's with low latency frequency alternation for anti-jamming,
- 5.8 GHz VTX modules with variable output,
- High-C LiPo batteries to maintain stable voltage under load (3s,4s,6s).

The racecourse included diverse aerial challenges such as multi-level gates, arc-style tunnels, sharp-angle turns, height-variation zones, and high-speed straight segments. These obstacles collectively evaluated drone stability, thrust management, yaw precision, and flight-controller tuning.



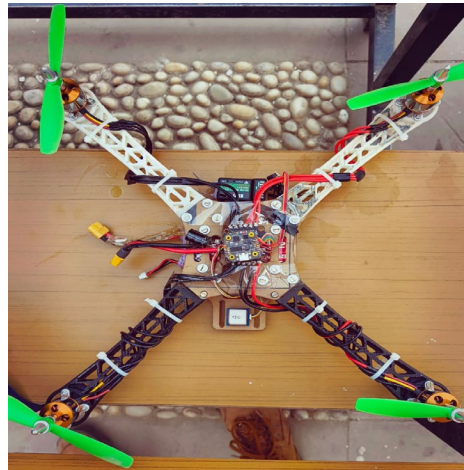
The team's drone utilized an 16-inch rigid carbon fibre frame with elevated limbs designed for stability, predictable handling and well-known frame for aerodynamic feasibility. Key components included an F722 (PIXHAWK) flight controller with adaptive filtering support, a 40A ESC stack capable of delivering clean current, and a stable 5.8 GHz TX system for uninterrupted transmission. This configuration enabled consistent performance even in RF-dense environments typical of Line of Sight Drone competitions. Throughout the event, the drone completed **seven successful flights**, with only **two minor penalties** (2 seconds and 4 seconds) awarded due to touchdown moments. The aircraft



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demonstrated dependable tuning characteristics, controlled maneuvering, and steady flight throughout all segments of the course.



The team secured a **third-place tie** with PEC University. Final placements were determined by penalty counts, resulting in PEC receiving the third position. Despite other teams using more powerful propulsion systems, optimized stacks, and digital FPV solutions, the team remained highly competitive due to disciplined flying, accurate line selection, and efficient system configuration. The event provided valuable insights into current advancements in UAV and FPV racing technology. Notable learning outcomes included:

- Application of **BlackBox logs** for PID refinement and gyro-noise reduction,
- Techniques for optimizing VTX signal power to minimize interference,
- Motor-propeller pairing strategies for improved agility,
- Aerodynamic and motor alignments using software integration for interperable flights and stability mid air,
- New custom stack flight controller for better performance and improved performance,
- ESC heat-management methods during extended high-load operation,
- Approaches to frame aerodynamics and drag reduction,
- Exposure to digital FPV platforms such as INAV, DJI O3 and Walksnail.



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Industry interactions highlighted emerging technologies, including CAN-based ESC protocols, machine-learning-supported filtering systems, and sensor-fusion approaches that enhance flight-stability. The event enabled effective networking with technical teams and industry personnel. A Boeing representative served on the judging panel, contributing expert insights into UAV applications and research areas. Communication with teams from other institutions encouraged knowledge sharing on hardware selection, radio-frequency management, repair workflows, and tuning philosophies.

Student coordinators and faculty members at the host institution extended cooperative support throughout the event. While minor accommodation issues occurred due to concurrent academic schedules, the overall environment remained engaging and academically stimulating. The insights gained are expected to contribute to enhanced preparation and innovation in upcoming UAV competitions at state and national levels.