



SATLAB



# Welcome to Satellite Lab MIET, Meerut



**Satlab** is a **student-run central facility** at **Meerut Institute of Engineering and Technology**, established in **2018** by a group of students from multiple disciplines with the goal of advancing research and development in **space technologies**. Their primary project involved constructing and launching a **cubesat**, a type of miniaturized satellite used for space research.



- **Cubesat Projects:** Design, build, and launch cubesats to contribute to space research and provide practical experience for students.
- **Research and Development:** Conduct cutting-edge research in space technologies and develop innovative solutions for space exploration and satellite technology.
- **Interdisciplinary Collaboration:** Foster collaboration among students from various disciplines to enhance learning and innovation in space technology projects.
- **Educational Outreach:** Organize workshops, seminars, and courses to educate and inspire the next generation of engineers and scientists in the field of space technology.
- **Industry Partnerships:** Establish partnerships with industry leaders and space agencies to gain support, share knowledge, and provide students with real-world experience.

# STUDENTS TEAM OF SATLAB

S. No.	Name	Sem / Branch
1	Rachit Teotia	7/ME
2	Vansh Kumar	7/CSE-AI
3	Yash Gupta	7/IT
4	Yashi Rai	7/CSE
5	Lokendra Soam	7/ME
6	Prakhar Sharma	5/CSE
7	Tulsi singh	5/CSE
8	Aayushi	5/CSE
9	Badal Kumar	5/CSE-AI
10	Aeshu Jain	5/CSE-AIML
11	Ananya Agarwal	5/CSE-IOT
12	Tanishka Vishnoi	5/ECE
13	Yash Sharma	5/CS

S. No	YEAR	ACTIVITIES
1	2018	SATLAB founded on 3 June 2018
2	2018	Built a 1U cubesat structure from scratch.
3	2018	Developed a yagi-uda antenna based satellite ground station.
4	2019	Team Pathik won 1st prize in <b>National Level Hackathon Tekno</b>
5	2019	Students from Team Pathik attended workshop on small satellite from IIRS Dehradun.
6	2020	Learned about the Drone technology
7		Built <b>first drone</b> of MIET

S. No	YEAR	ACTIVITIES
8	2021	Organized Orientation session for 2020 batch hiring
9		Two projects from Team Pathik won <b>2nd</b> and <b>3rd</b> prize in <b>IDEATHON</b> conducted at MIET.
10		Developed an autonomous drone for agriculture application.
11	2022	Organized a 1 day workshop a hands on workshop on drone
12		Organized a 5 day workshop in collaboration with <b>TiHAN IIIT-HYDERABAD</b> .
13		Conducted a seminar on cubesat and space for polytechnic students.
14		Team Pathik participated <b>CANSAT INDIA 2022</b> and presented <b>PDR</b> . Successfully <b>cleared first round</b> .



S. No	YEAR	ACTIVITIES
15	2023	Team Pathik presented <b>CDR</b> (Critical Design Review) for <b>Cansat-India</b> competition. Successfully <b>cleared second round</b> .
16	2023	In-SPACe director, <b>Dr. Vinod Kumar</b> , visited SATLAB in April 2023 for the inspection of Cansat progress evaluation.
17	2024	Team Pathik presented <b>PFR</b> (Pre-Flight Review) for <b>Cansat-India</b> competition. Successfully <b>cleared third round</b> .
18		<b>Cansat was launched</b> on 16 April 2024 in Ahmedabad, Gujarat. Cansat achieved its functionalities and all the systems were working fine.
19		Team Pathik from SATLAB was awarded certificates from ISRO chairman, <b>S. Somnath</b> .

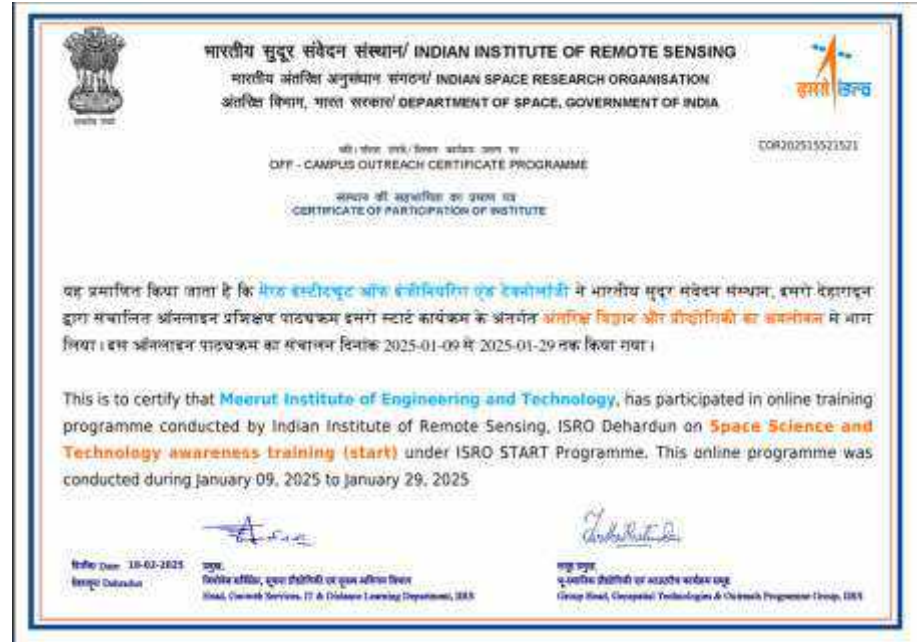


S. No	YEAR	ACTIVITIES
20		On 20th August 2024 at AICTE Headquarters Auditorium, New Delhi SatLab Faculty Coordinator Anurag Aeron joined event on “ <b>Creating a space EcoSystem</b> ”.
21		Team Pathik participated <b>ASI CANSAT/Model Rocketry INDIA 2024</b> and presented <b>PDR</b> . Successfully <b>cleared first round</b> .
22	2025	SatLab got certificate from IIRS Dehradun in Space Science and Technology awareness Training(start) conducted during January 09,2025 to January 29,2025
23		SatLab Students participated in “ <b>STEP 2025 and IPSC 2025</b> ” at IIT Roorkee.
24		Team Pathik presented CDR of <b>CANSAT</b> and <b>ROCKETRY</b> and cleared 2nd round



S. No	YEAR	ACTIVITIES
25		On 4 April 2025 <b>A.C. Mathur</b> sir visited Satlab.
26		<b>Bharat Shiksha Expo (BSE)</b> held from 24 April to 26 April 2025 and Satlab participated in BSE.
27		Team pathik went to Kushinagar from 25 oct to 31 oct for <b>CANSAT/Model Rocketry</b> competition and cleared PFR and jury round.
28		<b>Dr. Ram Avatar</b> , a distinguished researcher from <b>Hokkaido University, Japan</b> .visited our satlab

Certificate of participation from Indian Institute of Remote Sensing (IIRS, Dehradun) in Space Science and Technology awareness Training (START) conducted during January 09, 2025 to January 29, 2025





On 4th March, 2025 at IIT Roorkee, under the guidance of honorable Vice Chairman Sir and Director Sir, the SATLAB MIET students display the **CANSAT** and **Model Rocketry** to **Dr. V. Narayanan**, Secretary, Department of Space, Chairman Space Commission, Chairman ISRO and **Dr. Vinod Kumar**, Director IN-SPACe.



Our participation in the rocket and CANSAT competition was showcased at the international conferences '**S2\_STEP-2025**' and '**IPSC-2025**' held at IIT Roorkee. During the exhibition, our project and technical approach were well appreciated by the Chairman of ISRO, who acknowledged the team's innovation, design methodology, and commitment to advancing student-driven space research.



**Dr. Ram Avatar, a distinguished researcher from Hokkaido University, Japan, visited our SATLAB on 19 March 2025**



*We discussed how **CubeSats** can be integrated with Remote Sensing for environmental monitoring. Dr. Avatar provided insights into potential improvements in satellite communication and data processing.*



The **ISRO** scientists interacted deeply with the students, asking them about the choice of materials, system integration, and testing methodology. Their feedback was both technical and inspiring, providing the students a rare opportunity to discuss their ideas with actual space scientists.



**AC Mathur** sir and **Sharad Chandra Sharma** visited SATLAB with on 4 April 2025. Also **Ishita Sharma**(SATLAB alumni) was also present.

AC Mathur sir guided us how to build rockets more efficient and boost our confidence so that we can perform more better.



**The Bharat Shiksha Expo (BSE) 2025**, held from April 24 to 26, 2025, at the India Expo Centre & Mart, Knowledge Park II, **Greater Noida**, Uttar Pradesh as a representative of SatLab, a key participant in the expo, we played an integral role in managing our exhibition stall.

We are presenting our student-led initiatives in model rocketry and CanSat development, demonstrating hands-on aerospace engineering and innovation



We are engaging with industrialists to explore collaboration opportunities, discuss advancements in educational rocketry, and bridge the gap between academic learning and industry applications.



The fourth edition of the International Astronautical Federation (IAF) **Global Space Exploration Conference (GLEX 2025)**, themed "Reaching New Worlds - A Space Exploration Renaissance" and organized by the International Astronautical Federation (IAF), lit up New Delhi from **7 to 9 May**.



The MIET, Meerut has participated in this Global Event as Exhibitor and I got the opportunity to represent the MIET, Meerut at this prestigious Global Event at Yashobhoomi, Dwarka, New Delhi. Got opportunity to meet with First Indian Astronaut **Mr. Rakesh Sharma** and many other from USA, UAE, Israel, etc.



On National Space Day, 23rd August 2025, at **Bharat Mandapam**, New Delhi, the SatLab faculty coordinator visited the venue and met Mr. **Shubhanshu Shukla**. During the interaction, they discussed emerging opportunities in space education, ongoing student projects, and potential collaborations that could further strengthen hands-on learning and innovation within the institution's space initiatives.



Team Pathik conducted an **orientation session** on **26 August 2025**, providing students with comprehensive guidance and insights into rocket and satellite development. The session introduced participants to the fundamentals of aerospace engineering, mission planning, payload design, and hands-on prototyping.



Team Pathik participated in **ASI INSPACe Model Rocketry/CANSAT Competition** and successfully built CANSAT/Rocketry and get approved by respected Jury.



Team Pathik met **Mr. Shashank Mani (MP of Deoria district)** at Kushinagar during the **ASI CANSAT/Model Rocketry Competition 2025**, where they discussed the team's functioning, ongoing projects, and long-term vision. The team shared insights on their technical development, student involvement, and upcoming mission plans, while also receiving valuable encouragement and guidance for future growth.



**Rocketry Certificate**



**CANSAT Certificate**



## **SATLAB 2025 Outcome Report**

**Academic Year: 2025**

**Prepared by:**

**Team Pathik, SATLAB**

Room No. – 109, Admin Block

Meerut Institute of Engineering and Technology (MIET)



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## **Introduction**

SATLAB is a student-run facility dedicated to satellite systems research, Model rocketry development, flight avionics experimentation, and applied space engineering technology advancement. It does not operate under any specific department and functions independently as a student-driven multidisciplinary R&D environment.

The objective for 2025 was to establish hands-on capability across the complete Engineering cycle of a flight system: **simulation** → **design** → **fabrication** → **subsystem testing** → **ground validation**.

## **Major Projects Executed in 2025**

### **1) Model Rocket Development Program**

A 15 kg class model rocket was designed with a targeted apogee of 1000 meters.

The design stability margin was maintained between 1.5 to 2.5 Cal, aligning with accepted stable high-power model rocketry standards.

The system was engineered to carry and deploy a 1 kg payload having 15 cm diameter and 40 cm length at peak apogee altitude. An eco-friendly radial servo-driven ejection mechanism was used for payload and parachute deployment instead of black powder based ejection.

A parachute descent recovery system was engineered to limit descent velocity to 3 m/s for safe touchdown and minimal structural impact.



## 2) CanSat Development Program

A CanSat was developed for deployment at ~1000 m with a dual parachute sequence deployment:

- Drogue parachute for initial stabilization ~20 m/s
- Main parachute deployment at 500 meters altitude targeting final descent ~2 m/s

A reaction wheel was integrated inside the CanSat to achieve stable attitude control during atmospheric descent, enabling controlled angular damping and improving data quality during terminal fall.

## 3) Flight Computer & Real-Time Telemetry System

An indigenous avionics system based on ESP32 was developed as the flight computer. Communication was established using LoRa 900 MHz long-range telemetry.

Logged data parameters included: altitude, velocity, acceleration, GPS, IMU orientation, system status, battery voltage, current, power draw, and power system health.

The telemetry system underwent bench testing, subsystem integration testing, simulation-based validation loops and closed-loop ground operational testing.

## 4) Ground Launch Pad Development

A modular launch pad capable of handling 0.5 – 2 kg class rockets was developed enabling stable launch geometry, safe ignition alignment, and standardized repeatable launch preparation for future testing cycles.



### **Skill Development Outcomes (NBA Outcome Focused)**

- Flight dynamics calculations and stability margin interpretation
- PCB designing for flight computer hardware
- MATLAB-based ADCS simulation, hardware tuning & ground testing (CanSat focused)
- Aerostructural subsystem integration experience
- Telemetry acquisition & engineering data interpretation
- Parachute descent control engineering
- Systems engineering and reliability-focused approach

### **Research Culture Outcome**

SATLAB in 2025 established a repeatable engineering workflow capable of producing validated experimental aerospace hardware systems. The initiative demonstrated autonomous capability, independent scientific design decision making, and application of aerospace engineering methodologies in a controlled student-driven environment.

This capability foundation now positions SATLAB for higher maturity near-space missions, deployable CubeSat payload development, and advanced flight research in 2026.



## **PROJECTS FOR THE SESSION**

**2026**

**Prepared by:**

**Team Pathik, SATLAB,**

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# PROJECT 1: 1U CubeSat Structural Frame

## Objective

Design and fabricate a robust 1U CubeSat frame capable of surviving launch loads, vibration, and thermal stresses, while accommodating payload and subsystem modules.

## System Requirements

- Aluminum or hybrid composite frame
- Mounting interfaces for avionics, power, and payload
- Vibration-resistant joints
- Mass < 1.33 kg (standard 1U limit)
- Easy assembly and modularity for subsystem testing

## Expected Output

- Fully functional 1U CubeSat frame prototype
- Structural integrity under vibration and shock tests
- Modular mounting for future payload and avionics integration

## Skills Required:

- CAD and mechanical design
- Structural analysis (FEA)
- Materials selection and fabrication techniques



## **PROJECT 2: Thermal Management System**

### **Objective**

Develop passive thermal control solutions to maintain safe operating temperatures for avionics and payload under space conditions.

### **System Requirements**

- Thermal coatings or wraps
- Heat sinks for critical electronics
- Radiator placement for heat dissipation
- Compatibility with CubeSat structure

### **Expected Output**

- Thermal prototype validated under lab-based thermal cycling
- Documented thermal performance report

### **Skills Required**

- Heat transfer and thermal simulation
- Lab testing and thermal instrumentation
- Material evaluation for space environment



# PROJECT 3: CubeSat Avionics & Flight Computer

## Objective

Develop the core onboard computer and sensor system for telemetry, data logging, and subsystem control.

## System Requirements

- Microcontroller-based flight computer
- Sensors: IMU, barometer, temperature
- Interfaces for payload and deployment mechanisms
- Data storage and retrieval module

## Expected Output

- Reliable data logging during testing
- Triggering and monitoring of deployment subsystems
- Modular and compact avionics setup

## Skills Required

- Embedded programming
- PCB design and sensor interfacing
- Testing and debugging



## PROJECT 4: Ground Station

### Objective:

Create a control center for telemetry reception, visualization, and data logging during CubeSat tests.

### System Requirements:

- RF receiver compatible with CubeSat transmitter
- Data logging and GUI for visualization
- Optional command interface for subsystem control

### Expected Output:

- Real-time telemetry monitoring during lab and flight tests
- Structured data storage for post-mission analysis

### Skills Required:

- RF communication and signal handling
- GUI programming and data visualization
- Hardware-software integration