Indian Institute of Space Science and Technology

Trivandrum

Best Practice: **Learning through Real-time Application in the Small-spacecraft Systems and Payload Centre (SSPACE) at IIST.**

Objectives of the Practice - SSPACE at IIST aims to provide students with practical experience in conceptualizing, designing, and developing small spacecraft systems and payloads, educating students in spacecraft engineering through live space missions, creating industry-ready professionals, collaborating with industries to build space products and facilitate technology transfer, and designing subsystems and systems with maximum indigenous content to promote Make-in-India products for the space industry.

The Context - India's advancements in space technology have created a demand for skilled professionals in satellite design and development. As a unique space institute, IIST provides hands-on training to students in space system design, ensuring self-reliance and self-sufficiency in space technology.

The Practice - SSPACE has initiated several small satellite projects to design and implement space-borne hardware. These initiatives involve students' collaborative efforts and guidance from faculty members and ISRO scientists. UG students are introduced to spacecraft engineering in the third semester and can join a voluntary space mission design contest. Students work on specific subsystems until graduation, fostering deep expertise and teamwork to develop TRL 9-level products. These projects include the IIST Cubesat (AHAN), INSPIRE missions, ISAT2, XNAV, For the Venus mission nanosatellites, MOM-2, RPA (Retarding Potential Analyzer) and PILOT for the PS4 platform, MOM-2, Evidence of Success ARIS A technology demonstration mission with an RPA capable of measuring ion velocity, temperature, and velocity as a PS4 orbital stage payload flew successfully in the C-49 mission in April 2019.

InspireSat-1

A jointly developed small satellite mission between IIST, University of Colorado, Boulder, USA, NCU, Taiwan, and NTU, Singapore with Compact Ionospheric Payload (CIP) and Dual Axis X-ray Solar Spectrometer (DAXSS). Launched as a secondary payload on the PSLV C52 Mission on Feb. 14. 2022, science data is made public to Inspire Partners. https://www.iist.ac.in/inspiresat1

PILOT

PILOT (Pslv InorbitaL Obc and Thermals), a PS-4 payload developed for the PSLV C-55 mission launched on April 22, 2023, demonstrated a 3D-printed metal structure for

satellite applications, validated thermal simulation models using onboard sensor data, tested an indigenously designed OBC and flight software for future missions, and showcased RS485 telemetry communication.

ARIS-II

ARIS 201F, launched on PSLV C55 as a POEM payload, is an upgraded version of ARIS 101F featuring high-sensitivity sensors and optimized parameters for improved data collection in the Earth's ionosphere, including Dual-RPA and four electronic cards for comprehensive data acquisition.

Small satellite subsystems:

The goal of developing space missions at IIST is to build capacity in spacecraft engineering by having students design and develop subsystems. The onboard Computer and Electrical Power System for InspireSat-1 and InspireSat-2, designed at IIST, achieved TRL 9 qualification, demonstrating the institute's ability to produce high-quality, reliable subsystems. Development of a communication board, altitude determination and control system, and cold gas thrusters is ongoing and provides hands-on learning experience and advancing indigenous spacecraft technology.

Ground Station

A fully operational satellite ground station facility facilitates learning and hands-on experience in radio communication, satellite tracking, antenna positioning/ control systems, telemetry data visualization/ processing, real-time commanding, and mission operations.

Problems Encountered and Resources Required: Implementing student-driven satellite projects faces challenges of continuous student commitment, effective knowledge transfer, and interdisciplinary demands. Essential resources include ample lab space, computing equipment/workstations, safety measures, collaboration tools, and adequate funding and institutional support.

Testimonials

Click here for more details.