

A Report on Industrial Visit to "ISTRAC/ISRO, Bengaluru" **Organized by Department of CSE- Artificial Intelligence & Machine Learning** **on 24.10.2025**



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Event Organizers: Mr. BSH. Shayeez Ahamed, Assistant Professor, Department of CSE (AI and ML); Dr. S. Priya, Sr. Assistant Professor, Department of CSE (AI and ML)

Participants: II & III Year CSE (AI and ML) – 40 Students

Mode of Conduct: Offline

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Introduction:

On 24th October 2025, a group of B.Tech. III and II Year/I Sem – CSE (AI and ML) and CSE (Networks) students from Madanapalle Institute of Technology, Madanapalle, Andhra Pradesh, embarked on an industrial visit to the ISTRAC/ISRO, Bengaluru. The primary objective of the visit was to gain practical insight into the operations of India's national space agency, observe the technologies behind satellite launching and mission management, and understand the real-world applications of space technology. The visit included a tour of the mission control centre and a detailed presentation on ISRO's past achievements, ongoing projects, and future ambitions.

Overview of ISRO and its Heritage

The session began with an overview of ISRO's history and organizational structure.

- **Founder:** The foundation of the Indian space program was laid by its visionary founder, Dr. Vikram Sarabhai.
- **Historical Context:** We were reminded of ISRO's humble beginnings, with anecdotes of early rocket parts being transported on bicycles and bullock carts, highlighting the journey to its current state-of-the-art capabilities.
- **Organizational Scale:** ISRO currently employs approximately 17,000 people and operates with an annual budget of around ₹13,000 crore.
- **Key ISRO Centers:** The presentation outlined the roles of various lead centers across the country:

- **VSSC (Vikram Sarabhai Space Centre), Trivandrum:** Leads in launch vehicle design.
- **LPSC (Liquid Propulsion Systems Centre), Trivandrum & Bengaluru:** Develops liquid and cryogenic propulsion stages.
- **SDSC-SHAR (Satish Dhawan Space Centre), Sriharikota:** The "Spaceport of India" responsible for launch operations.
- **URSC (U R Rao Satellite Centre), Bengaluru:** The primary center for satellite design and development.
- **SAC (Space Applications Centre), Ahmedabad:** Focuses on developing space-based applications.
- **NRSC (National Remote Sensing Centre), Hyderabad:** Manages data from remote sensing satellites.

Launch Vehicles: The Workhorses of ISRO:

A significant portion of the discussion was dedicated to India's launch vehicle technology and its evolution.

- **PSLV (Polar Satellite Launch Vehicle):** ISRO's most reliable workhorse, with 54 successful launches. It is renowned for its role in missions like Chandrayaan-1, Mars Orbiter Mission, and for setting a world record by launching 104 satellites in a single mission.
- **GSLV (Geosynchronous Satellite Launch Vehicle):** With 14 launches, this vehicle is primarily used to deploy heavier communication satellites into Geostationary Orbit.

- **LVM3 (Launch Vehicle Mark 3):** Formerly the GSLV MkIII, this is ISRO's heavy-lift vehicle, with 4 successful launches, including the Chandrayaan-3 mission.
- **Evolution of Launchers:** A timeline was presented, showing the progression from RSLV in 1993, GSLV in 2001, LVM3 in 2017, and the new SSLV (Small Satellite Launch Vehicle) in 2022.
- **Future:** ISRO is actively working on the NGLV (Next Generation Launch Vehicle), projected for development between 2031-2032.



Mission Control and Satellite Operations:

The visit to the Mission Control Center was a key highlight. This facility is managed by ISTRAC (ISRO Telemetry, Tracking and Command Network).

- **ISTRAC's Role:** ISTRAC is responsible for tracking, telemetry, and command (TTC) services for all of ISRO's satellite and launch vehicle missions.
- **Global Network:** It operates a worldwide network of ground stations, including 28 TTC stations, to maintain continuous contact with space assets.
- **Orbital Mechanics:** Basic concepts of spaceflight were explained, including:
 - **Escape Velocity:** 11.2 km/s.
 - **Common Orbits:** Low Earth Orbit (LEO) at 500-900 km and Geostationary Orbit (GEO) at 36,000 km.
 - **Celestial Distances:** The Moon (3,85,000 km) and Mars (approx. 225 million km) were cited as mission destinations.

Key Missions and Future Programs:

Several of ISRO's landmark missions were discussed in detail.

- **Chandrayaan-3:** We were shown a landing animation of the Chandrayaan-3 mission. The process of the ramp deploying from the lander, followed by the rover powering on and rolling down onto the lunar surface, was demonstrated. The landing site is named Sivasakthi Point.
- **Gaganyaan Programme:** An overview of India's ambitious human spaceflight program was provided.
- **NISAR (NASA-ISRO Synthetic Aperture Radar):** This upcoming joint Earth-observation mission with NASA was highlighted.
- **Bharatiya Antariksha Station (BAS):** The vision for India's own space station by 2035 was shared, and videos of docking and undocking procedures were shown to illustrate the complexities involved.



Space Applications and Societal Benefits:

A major focus of the presentation was how ISRO's technology is leveraged for direct societal benefit.

- **Indian Remote Sensing (IRS) Satellites:**
 - ISRO operates 26 remote sensing satellites (24 in LEO, 1 in lunar orbit, and 1 in Mars orbit).
 - The IRS-1A was mentioned as the largest sensing satellite.
 - Data from these satellites is used for forest fire finding, cyclone monitoring and prediction, and creating detailed maps (available via nrsdc.gov.in).
- **Search and Rescue (SAR):**
 - The INMCC (Indian Mission Control Centre) for Search and Rescue has been operational since 1990.
 - It provides services to the Indian region and 7 other countries, using the 406 MHz UHF band to detect distress signals.
- **Services for Fishermen:**
 - ISRO provides crucial Potential Fishing Zone (PFZ) advisories.
 - This data is derived from satellite measurements of chlorophyll, sea surface temperature, and winds, helping fishermen improve their catch and safety.
- **Data Dissemination:**
 - The ISSCDC (Indian Space Science Data Centre) at isscdc.gov.in serves as the primary archive for data from ISRO's space science missions.

Conclusion:

The industrial visit to ISRO was an immensely valuable experience. It provided a comprehensive understanding of the organization's vast capabilities, from building complex launch vehicles and managing intricate space missions to translating space technology into tangible applications that benefit the common citizen. The briefing on flagship projects like Chandrayaan-3 and Gaganyaan offered an exciting glimpse into the future of Indian space exploration.



Outcomes:

1. Students Enhanced the Understanding of Space Technology and Applications.
2. Students had Exposure to Mission Control and Data Management Systems.
3. Students had Insight into National Achievements and Future Missions.
4. Students had the Awareness of AI and ML Applications in Space Research.

UN-SDG Mapping:

SDG 4 – Quality Education

SDG 8 – Decent Work and Economic Growth

SDG 9 – Industry, Innovation, and Infrastructure

SDG 13 – Climate Action

SDG 14 – Life Below Water