

ACHIEVEMENTS OF CONTEMPORARY BHARAT



सत्यमेव जयते

MINISTRY  
OF EDUCATION  
Government of India

# CHANDRAYAAN UTSAV

CODE  
1.4S



SPECIAL MODULE

विद्यया ऽ मृतमश्नुते



एन सी ई आर टी  
NCERT

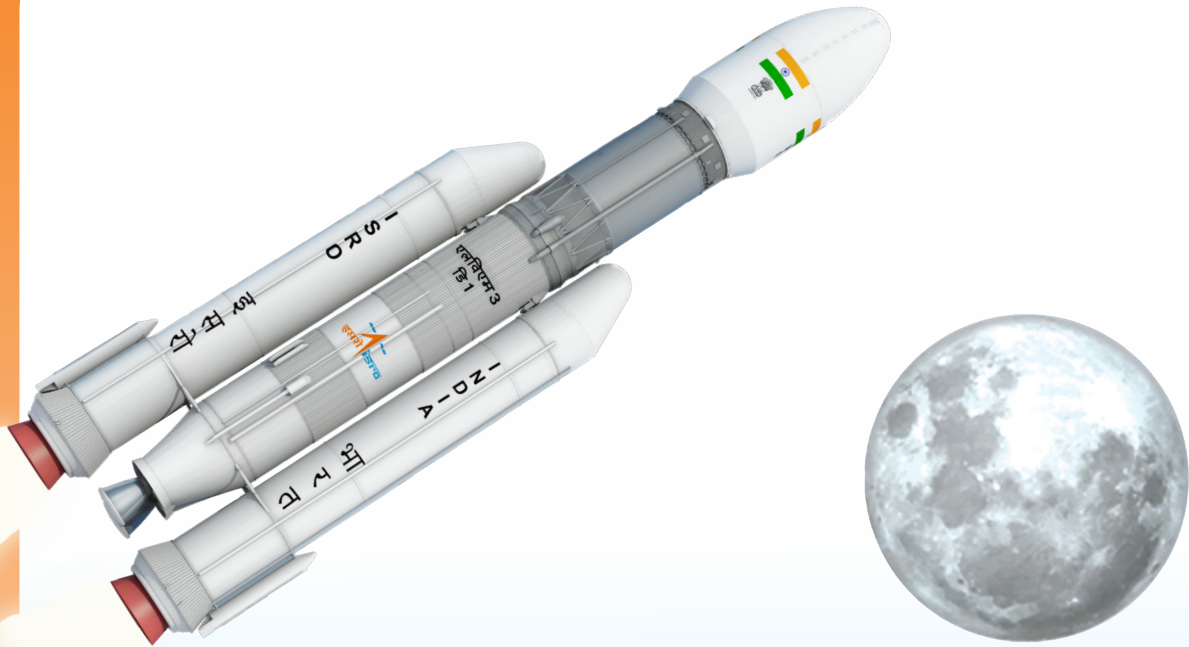
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# Chandrayaan: Journey Towards the Moon

Secondary Stage

Chandrayaan-3 is one of the most prominent and historic lunar missions of Bharat that has garnered global attention. It is the third lunar mission of Bharat, which was launched to achieve the unfulfilled objectives of Chandrayaan-2. The success of this mission has demonstrated the burgeoning space capabilities of Bharat on a low budget. With the vision of ‘One Earth, One Family, One Future’, the Hon’ble Prime Minister, Shri Narendra Modi has played a crucial role in the triumph of the Chandrayaan-3. The philosophical concept of *Vasudhaiva Kutumbakam* in Bharatiya civilisation is echoing on a global level with the success of this mission, under the leadership of the Hon’ble Prime Minister, Shri Narendra Modi. This mission will highlight the technological advancement of Bharat in lunar exploration.

## Chandrayaan: Journey Towards Moon

“Shyama! Have you ever imagined life on the moon?” asked Ayan. “Don’t you know that Bharat has landed near the South Pole of the moon? This mission is known as ‘Chandrayaan-3’ and will research the availability of water on the south pole of the moon”, replied Shyama.

### Did you know?

Only three countries other than Bharat have landed on the moon. They are Russia, China and the United States of America.

Chandrayaan-3 is a follow-up mission to Chandrayaan-2 (2019) and Chandrayaan-1 (2008), the third part of the series of lunar exploration missions developed by the prestigious Indian Space Research Organisation (ISRO) under the leadership of our Hon’ble Prime Minister, Shri Narendra Modi. Imbibing the values of *Vasudhaiva Kutumbakam* and ‘One Earth, One Family, One Future’, the mission will set a benchmark for all other countries and further aid them in future explorations.

*“Bharat is on the Moon. We have our national pride placed on the Moon.”*

*– Prime Minister Narendra Modi*

The historic Chandrayaan-3 mission, aims to understand and get information regarding the lunar surface and how it will be beneficial to mankind. It intends to engineer and implement a lander to land safely and softly on the surface of the moon, observe and demonstrate scientific experiments, and draw conclusions.

So, what does the mission want to do? Here are some of the important objectives of the mission: to demonstrate the ability to soft-land on the moon; to demonstrate the rover Vikram's ability to move on the moon; and to conduct in-situ scientific experiments on the materials available on the lunar surface to better understand the composition of the moon.

The idea of undertaking a Bharatiya scientific mission to the Moon was initially raised in a meeting of the Indian Academy of Sciences in 1999. A National Lunar Mission Task Force was constituted by the Indian Space Research Organisation (ISRO) and provided an assessment of the feasibility of a Bharatiya mission to the moon. The first Bharatiya moon mission was 'Chandrayaan-1' that was launched on 22 October 2008, from Satish Dhawan Space Centre, Sriharikota, Andhra Pradesh, under the then chairmanship of ISRP Shri G. Madhavan Nair. The mission achieved 95 per cent of its objective and was concluded on 28 August 2009, due to sensor failure after nine months of operation in the lunar orbit.

Chandrayaan-2, was the second spacecraft in the Bharatiya series of lunar exploration satellites, which was launched on 22 July 2019' from the second launch pad at Satish Dhawan Space Centre SHAR, Sriharikota, by GSLV Mk-III under the chairmanship of K. Sivan, *Chairman*, ISRO. It comprised of an orbiter named *Vikram* and rover named *Pragyan* to explore the unexplored south polar region of the Moon. In September 2019, communication from the lander to the ground stations was lost, and *Vikram* and *Pragyan* crashed on the lunar surface.

Chandrayaan-3 was launched on 14 July 2023, under the chairpersonship of S. Somanath, *Chairman*, ISRO, to fulfil the unachieved objectives of Chandrayaan-2. On 23 August 2023, the lander *Vikram* successfully landed on the moon, and the landing point was named as the *Shiv Shakti* point. Bharat became the first nation to land near the South Pole and the fourth nation to soft land on the Moon.

Can a failure become a setback for someone who wants to achieve something? Does it put a limit on one's capabilities? Obviously not. Failures and obstacles, in fact, bring more out of us. They prepare us

### Activity 1

Make a short video or presentation on the important dates of Bharat's lunar mission.



for the worst of situations and make sure that we accomplish our goal in any circumstance. The Chandrayaan-3 mission of our country is a strong example of how one should turn their shortcomings into strengths and achieve the greatest feat.

The Chandrayaan-3 is a marvellous piece of engineering and innovation. It comprises two broad components: the Propulsion Module (PM) and the Lander Module (LM). The Lander Module further contains the lander, which is named *Vikram*, and the rover, which is named *Pragyan*. The lander and the rover are the heart and soul of this mission, as these are the ones that will carry out numerous expeditions and inspections on the lunar surface. Each of the components is equipped with sophisticated instruments that have specific functions oriented towards achieving the objectives of the mission. The instruments and their functions are detailed below.

### The Propulsion Module (PM)

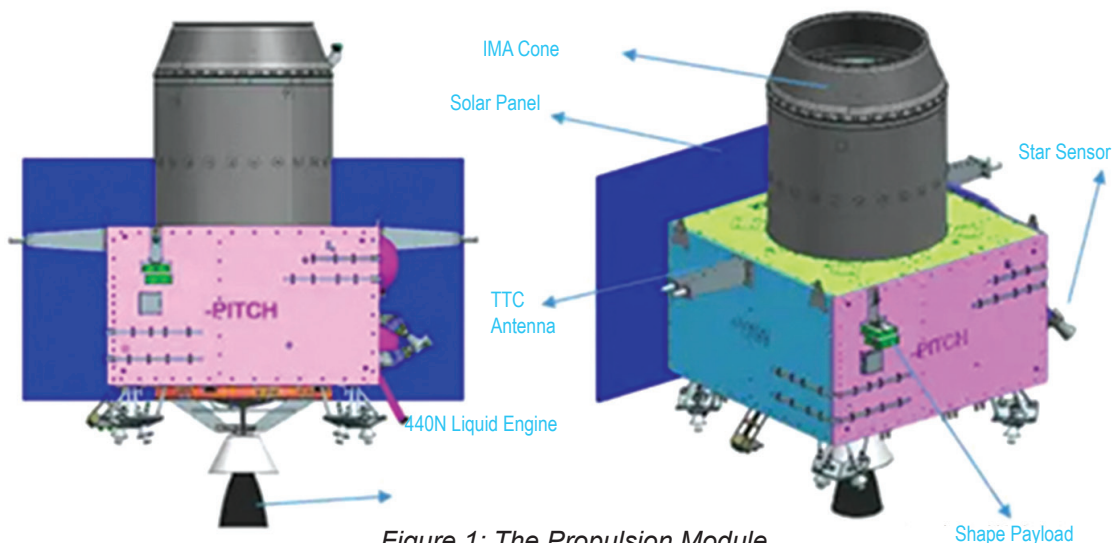


Figure 1: The Propulsion Module

Source: [https://www.isro.gov.in/Chandrayaan-3\\_New.html](https://www.isro.gov.in/Chandrayaan-3_New.html)

The function of the Propulsion Module (PM) is to carry the Lander Module (LM) to 100 km from the moon. After that, the LM will get separated from the PM and continue the descent further. The PM has an instrument named Spectro-Polarity of Habitable Planet Earth (SHAPE)

that will study the spectral and polarimetric measurements of earth from the lunar orbit after the LM separation.

## The Lander Module (LM)

The Lander Module contains the following:

### (a) The lander (Vikram)

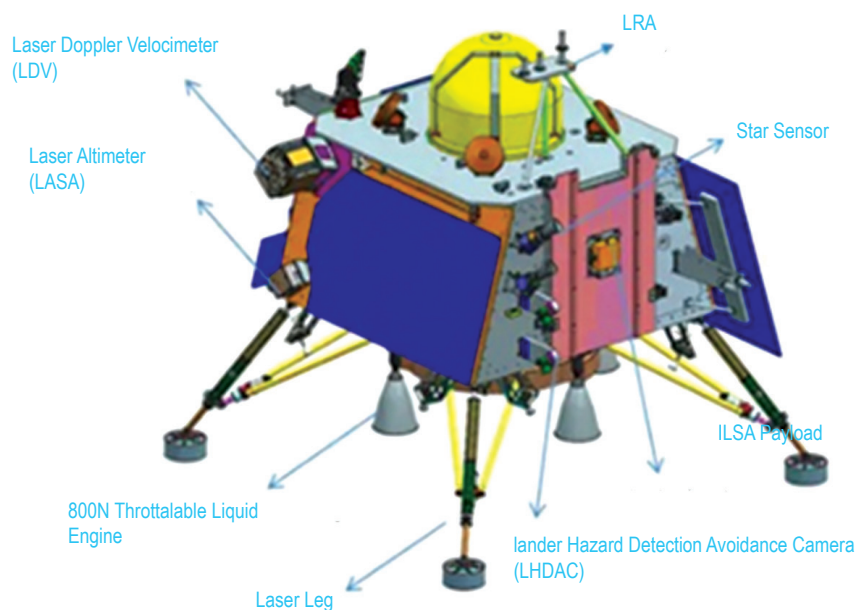
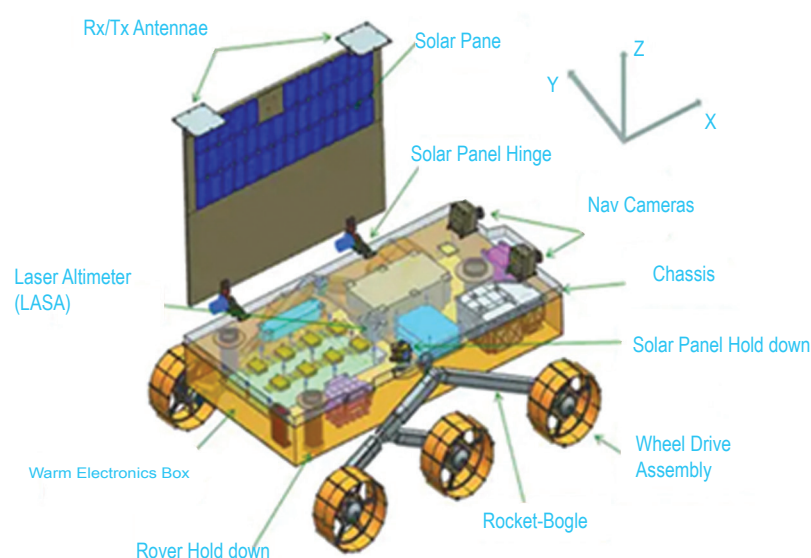


Figure 2 : The Lander (Vikram)

Source: [https://www.isro.gov.in/Chandrayaan-3\\_New.html](https://www.isro.gov.in/Chandrayaan-3_New.html)

The role of the lander is to make a soft landing at the south pole of the moon with the rover. Besides, it has the following instruments that will carry out various observations of the lunar surface: (i) Radio Anatomy of Moon Bound Hypersensitive ionosphere and Atmosphere (RAMBHA) — to measure the near surface plasma (ions and electrons) density and its changes with time; (ii) Chandra's Surface Thermo physical Experiment (ChaSTE) — to carry out the measurements of thermal properties of the lunar surface near the polar region; (iii) Instrument for Lunar Seismic Activity (ILSA) — to measure seismicity around the landing site; and (iv) LASER Retroreflector Array (LRA) — it is a passive instrument to understand the dynamics of the moon system.

**(b) The rover (Pragyan)**

**Figure 3 :The Rover (Pragyan)**

Source: [https://www.isro.gov.in/Chandrayaan-3\\_New.html](https://www.isro.gov.in/Chandrayaan-3_New.html)

The rover has the following instruments installed in it: (i) LASER Induced Breakdown Spectroscope (LIBS) — it derives the chemical and mineralogical composition of the lunar surface. It is a scientific technique that analyses the composition of materials by exposing them to an intense laser pulse. It is doing qualitative and quantitative elemental analysis on the lunar surface. It has made the first ever in-situ measurements on the elemental composition of the south lunar surface. Preliminary analysis has unveiled the presence of the elements: aluminium, sulphur, calcium, iron, chromium, titanium. Thorough investigation regarding the presence of hydrogen is underway; (ii) Alpha Particle X-ray Spectrometer (APXS) — it determined the elemental composition of lunar soil and rocks around the lunar landing site. APXS observations have discovered the presence of minor elements, including sulphur and major expected elements such as aluminium, silicon, calcium, and iron.

### Activity 2

Draw a paper model of the Chandrayaan-3 rocket to display in the classroom. Pen down your feelings on this historic achievement of Bharat on a chart paper in the form of a painting or poem.

All these components of the Chandrayaan-mission were made indigenously at a lower cost than the hollywood space film ‘Interstellar’. The



total cost of Chandrayaan-3 is around ₹ 615 crore. The *Pragyan*, *Vikram*, and propulsion costs are approximately around ₹ 215 crore.

## Lunar South Pole: The Landing Site

The first question that arises in our mind is “Where is the Lunar South Pole?” The lunar south pole is the southernmost point on the moon, at 90 degrees south. But then, “What is the exact landing site of Chandrayaan-3?” As per NASA’s (National Aeronautics and Space Administration) LRO (Lunar Reconnaissance Orbiter), the Chandrayaan-3 lander module landing site is about 600 km away from the south pole of the moon, which is named by the Hon’ble Prime Minister, Shri Narendra Modi as *Shiv Shakti*.

### Have you ever thought that there are many other places on the lunar surface, but what makes the moon’s south pole important?

This place is of special interest to scientists because of the potential for the occurrence of water ice in permanently shadowed craters. Based on the earlier mission, i.e., ‘orbital mission’ and ‘flyby mission’ it was found that certain dark craters in the south pole of the moon have the highest potential for the occurrence of water, if there is any. NASA has described the dark craters as, ‘full of mystery, science and intrigue’.

#### Did you know?

South pole’s craters have been under perennial shadow and scientists claim they might contain massive water resources, which amounts to nearly 100 tonnes of water.

The mountain peaks near the pole are illuminated for large periods of time and could be used to provide solar energy to an outpost. With an outpost on the moon, scientists will be able to analyse water and other volatile samples.

This region is also rich in minerals. The craters are the cold traps that contain planetary fossils (hydrogen, water, ice, and other volatiles dating from the early solar system), which could help scientists learn more about the history of our solar system. The reason behind this is that the moon’s axis is tilted only 1.5 degrees which restricts the penetration of sunlight to the poles of the moon, and the temperature in the Polar Regions is as low as  $-248^{\circ}$  Celsius. In these regions, water and other compounds become frozen within the soil, accumulating over billions of years.

The lunar south pole is a place where scientists may be able to perform unique astronomical observations of radio waves under 30 MHz. This is because the lunar south pole has many mountains that are not facing earth and are the ideal place to receive such astronomical radio signals from a ground radio observatory.

Elements known to be present on the lunar surface include hydrogen, oxygen, silicon, iron, magnesium, calcium, aluminium, manganese, and titanium. Among the more abundant are oxygen, iron, and silicon. The oxygen content is estimated at 45 per cent (by weight). NASA's Artemis programme has proposed to land several robotic landers and rovers in preparation for the 2025 Artemis 3 crewed landing in the South Polar Region. It will study the data from the Chandrayaan-3 landing mission to fine tune its mission parameters.

The leadership quality of Hon'ble Prime Minister, Shri Narendra Modi led to Chandrayaan's triumph.

*"There will be a new dawn and a brighter tomorrow very soon."*

*Prime Minister Narendra Modi*

This statement, delivered by the Hon'ble Prime Minister Shri Narendra Modi, paved the way for Bharat after the failure of Chandrayaan-2. The image of PM Shri Narendra Modi embracing K Sivan, the former chief of ISRO, is still fresh in our minds. Sivan was dejected after the loss of communication with the lander. Despite the loss of energy, time, effort, and money on the mission, PM Shri Narendra Modi was not discouraged; instead, he emerged confidently and motivated the ISRO scientists and people of the country for the new vision. Being the leader of the nation, his resilience was greatly appreciated globally.

The victory of the Chandrayaan-3 mission is an unforgettable moment in the pages of the history of Bharat's space programme. The prime minister was attending the BRICS summit in South Africa. The absence of him during the success of the Chandrayaan-3 mission was filled when he virtually joined ISRO scientists. He then flew directly to Bengaluru and congratulated the scientist and the nation. This showed how he was



Figure 4: Prime Minister celebrates the success of Chandrayaan-3

overwhelmed by the success of Bharat's mission.

The theme of the 18th G20 summit, *Vasudhaiva Kutumbakam* or 'One Earth, One Family, One Future' by the Hon'ble PM Shri Modi echoed across the globe. This success of Bharat is globally celebrated by people who believe in science and see a future in science. This was a great sign of innovation and the use of space technology, which fosters sustainability. Despite ISRO playing a great role in the success, but at the same time, PM Shri Modi also praised the support of Bharat's industries, private companies, and micro, small and, medium enterprises. This is the success of both science and industry.

After Bharat became the 4th country in the world to reach the south pole of the moon, the Prime Minister and ISRO were greatly praised by international space agencies across the globe, such as NASA and European Space Cheifs, etc. This was a great milestone for our country to hold this place in global space research. The leadership of Hon'ble Prime Minister, Shri Narendra Modi played a crucial role in the triumph of Chandrayaan-3 and landed our country's name on the surface of the moon.

### ***Vasudhaiva Kutumbakam***

*Vasudhaiva Kutumbakam* is the principle of Bharatiya civilisation. It is a Sanskrit phrase taken from the Maha Upanishad that has a very beautiful

### **Activity 3**

Make a scrapbook on the lives of five ISRO scientists who have contributed to Bharat's lunar mission.





*Figure 5: Prime Minister celebrating the success of Chandrayaan-3 with the scientists of ISRO*

meaning, “The whole world is one family”. It is a philosophical concept that nurtures the idea of universal brotherhood and interconnectedness among all members of the global community. Now, in the present context of rapid globalisation leading to an increasingly interconnected world, the message of Vasudhaiva kutumbakam is becoming more relevant than ever. Today, it is not limited only to the earth; but it is also expanded to space.

ISRO also follows the practice of sharing information and data with other space agencies. Recently, the Chandrayaan-3 mission has been ongoing, and ISRO is going to share the information and findings for global welfare. On the joyous occasion, when Chandrayaan-3 made a soft landing on the lunar South Pole surface, the Hon’ble Prime Minister, Shri Narendra Modi greeted the entire world. He delivered his message as, “This success of Chandrayaan-3 belongs to all of humanity”. This mission is based on a human-centric approach to supporting the idea of “One Earth, One Family, One Future”. The Prime Minister announced that moment as, “the first light of success in the dawn of amrit kaal”. Whatever data is gathered from Chandrayaan-3 will not be limited to Bharat alone; it is going to be useful for the welfare of the world.

## Chandrayaan-3: Future Prospects and Significance

The Chandrayaan-3's remarkable feat has opened up a new horizon of opportunities for several space start-ups, which will trigger the 'Make in Bharat' brand and contribute to the growth of home companies. Apart from boosting the government's future budgetary allocation towards space research, it will also attract private investment in allied sectors, ultimately contributing to the economic growth of the country. The Chandrayaan-3 mission will also help in employment; now more students wish to join the space tech ecosystem, increasing Bharat's employment rate. Apart from economic bloom, it will provide a better understanding of lunar water and the potential for human habitation on our celestial neighbour.

The mission will establish Bharat as an efficient country in the space sector under the able guidance of our Honourable Prime Minister, which will further help us collaborate in future space missions with other countries. It will help us prove to the world that we can send heavier payloads into space in the future. It will also ensure Bharat's membership in the exclusive space club that has just three countries so far: the United States of America, Russia, and China. This mission along with all other previous missions, has helped our country, Bharat, become one of the largest emerging industries in the contemporary world.

Chandrayaan-3 is the third in the series of lunar explorations by the Indian Space Research Organisation after the failure of Chandrayaan-2. Its objectives include—demonstration of soft landing on the Moon, and the study of the composition of the Moon. With the soft landing of Chandrayaan-3 on 23 August 2023, Bharat became the first country to land on the South Pole of the Moon. The Propulsion Module and the Lander Module are two major components of Chandrayaan-3. The landing site is named 'Shiv Shakti Point' by the Hon'ble Prime Minister, Shri Narendra Modi. The south pole has the potential for water resources. The achievements of the scientists of the ISRO were highly appreciated and

### Activity 4


Using waste materials, make a collage of the reactions of the people of Bharat to the successful landing of Chandrayaan-3 on the moon surface. Remember, a detailed description should be added to the collage. The best collage can be displayed in the school's magazine.





## *Chandrayaan Utsav*

celebrated by the Hon'ble Prime Minister, Shri Narendra Modi. He has assured that the data generated through the mission will be used for the welfare of the world, spreading the message of *Vasudhaiva Kutumbakam* of *Bharatiya* Civilisation.



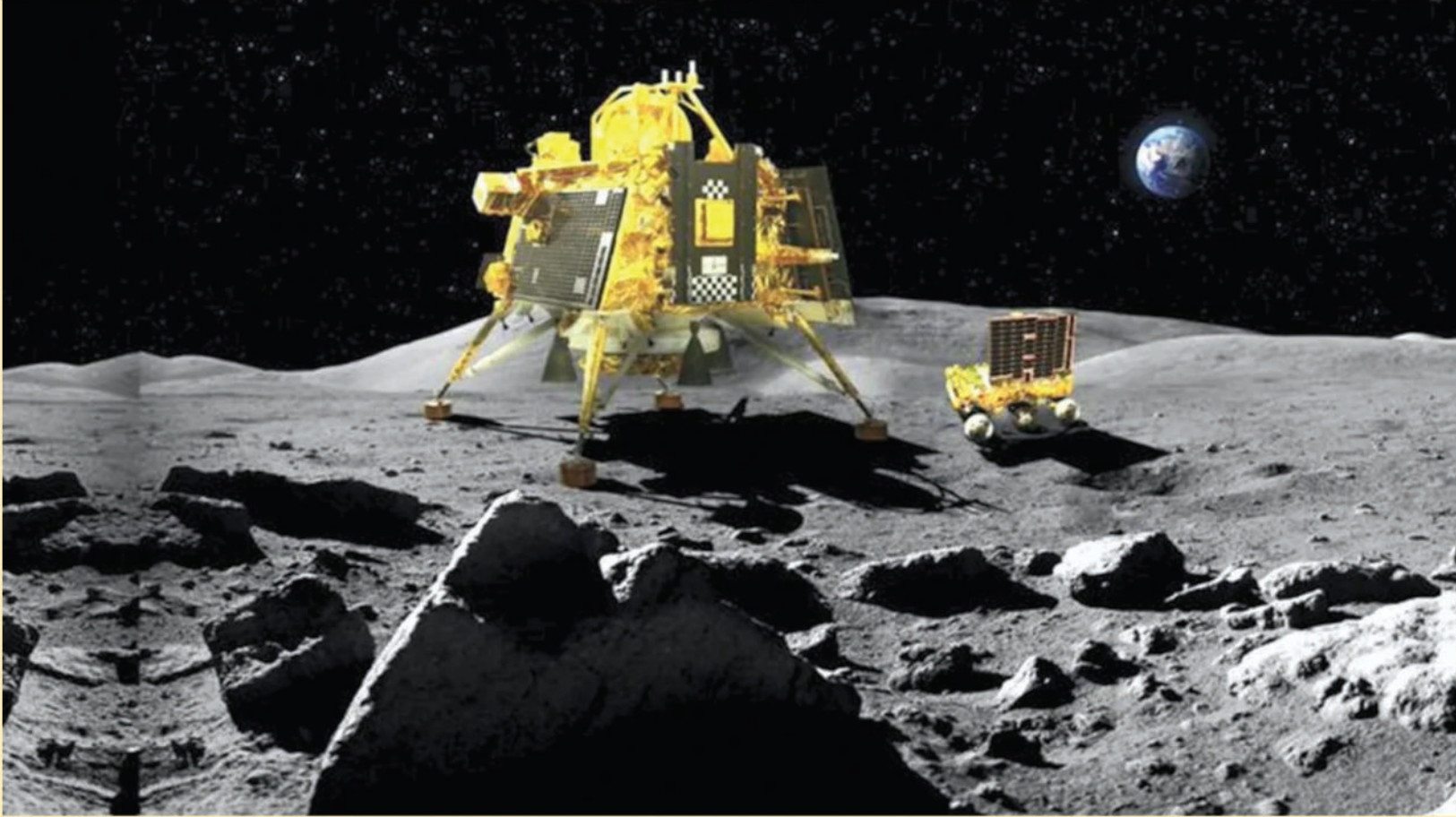


## Theme 1.0 Chandrayaan Utsav

- |      |    |  |
|------|----|--|
| 1.1  | F  | हमारा चंद्रयान<br>Our Chandrayaan                    |
| 1.2  | P  | <i>Mera Pyara Chanda: Rani ki Khoj</i>               |
| 1.3  | M  | Chandrayaan Mission: Bharat's Expedition to the Moon |
| 1.4  | S  | Chandrayaan: Journey Towards the Moon                |
| 1.5  | S  | Exploring the Moon Mission of Bharat                 |
| 1.6  | S  | Towards Moon and Beyond                              |
| 1.7  | S  | Exploring Chandrayaan-3: Bharat's Lunar Mission      |
| 1.8  | HS | Bharat on the Moon                                   |
| 1.9  | HS | Bharat Space Mission: The Chandrayaan Mission        |
| 1.10 | HS | Physics of Chandrayaan-3                             |

For participation in the activities related to Apna Chandrayaan:  
Visit : [www.bharatonthemoon.ncert.gov.in](http://www.bharatonthemoon.ncert.gov.in)

For more information:  
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PMeVIDYA IVRS: 8800440559



An image of Rover *Pragyan* with Lander *Vikram*

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राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्  
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