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**XAVIER INSTITUTE  
OF ENGINEERING**

A SISTER INSTITUTION OF ST. XAVIER'S COLLEGE

**INDUSTRIAL VISIT TO  
SATELLITE EARTH STATION,  
YEUR, THANE**

DATE: 29/02/2020

**Event Coordinator(s)**

1. Prof. Shailaja Udtewar
2. Mr. Rajendra Bonde
3. Ms. Madhuri Jawale

**Student Coordinator(s)**

Ms. Manali Parab

**Time & Place:**

10:00 a.m. to 2.30 p.m

**BSNL Satellite Earth  
Station, Yeur, Thane**

**Department:**

**Electronics and  
Telecommunication**

**No. of participant:**

3 Faculty

17 Students

**OBJECTIVE:**

To amalgamate theoretical knowledge with the practical one. Knowledge through books alone is not sufficient. Thus, the Department of Electronics and Telecommunication, Xavier Institute of Engineering strive to acquaint its students with the latest technology and developments in the world.

An Industrial Visit to a Satellite Earth Station at Yeur, Thane was planned for Final year EXTC students to make them aware of the various tasks and activities or work carried out in the Earth Station. Every engineering student has a right to fair knowledge in this fast-growing technology, since, Satellite Communication is a fast growing field, having advanced uninterrupted features and on huge demand in the global market.

**SCOPE:**

As students of the final year Electronics and Telecommunication have Satellite Communication and Networks as one of their subjects, so the visit to Satellite Earth Station, Yeur, Thane would definitely help them to provide a practical scenario of Satellite Communication and Networks and the Earth Station.

**RESOURCE PERSONS:**

1. Mr. Ashok Katakdhond, Divisional Engineer (Satellite Mtce)
2. Mr. Arjun Gupta, Junior Telecom Officer
3. Mr. Swapnil Patil, Junior Telecom Officer

Prof. Shailaja Udtewar  
Event Coordinator

Dr. Vidya Sarode  
HOD EXTC

Dr. Y. D. Venkatesh  
Principal

**Head of the Department PRINCIPAL**  
Department of Electronics and Telecommunication  
Xavier Institute of Engineering  
Mahim Causeway, Mahim (W), Mumbai - 400 019  
PRINCIPAL  
Mumbai - 400 019

A group of 17 students gathered around 10.30 a.m. at the BSNL Earth station. The day started off with a prayer and welcome speech by Mr. Ashok Katakdhond, who also spoke about the inescapable role of satellites in today's world. Then students were then divided into 2 groups and each group underwent vigorous training.

In the first session, students were explained about the basic transmission and reception blocks of the C-Band INSAT 3C satellite system by Mr. Arjun Gupta. The students were shown a number of equipment that was handling satellite live traffic. Students were also able to visually observe the spectrum of C-Band (IDR), Ku- Band and Ka-Band HUB the precautions and measures that are taken while handling such equipment.

In the second session, VSAT architecture and networking by VSAT for data communication was demonstrated to the students by Mr. Swapnil Patil. Very Small Aperture Terminal (VSAT) refers to an earth station linked to the satellite using RF link and usually will have different diameter antennas. VSATs provide an important communication link to set up a satellite-based communication network. VSATs can be used for voice, data, or video transmission and reception.

Corporations and Organizations that require financial and other information to be exchanged between their various locations use Artificial Satellites (about 3000) to facilitate the transfer of data through the use of Very-Small-Aperture-Terminal (VSAT) networks.

VSAT comprises of two modules viz. an outdoor unit and an indoor unit. The outdoor unit mainly houses Antenna, feed horn, RF Transceiver, LNA, Power Amplifier. The antenna size is typically 1.8 or 2.4 meter in diameter, although smaller antennas are also in use. The indoor unit functions as MUX-DEMUX, modem, and interfaces with the end user equipment like PCs, LANs, Telephones or an EPABX.

The VSAT's (Very Small Aperture Terminal) communicates to the HUB through AM1 satellite. A HUB is located at Bangalore and VSAT's are located all over the country. All the VSAT's are connected in a star topology but communicates through the HUB at Bangalore. The Instructor at BSNL also explained the students about how frequencies of K, Ku and C band were used at the center to provide data communication using VSAT to every house. VSAT 's were used because it could make communication possible even in places where conventional media like copper cable, optical fiber, radio & microwave would not be possible.

In the third session, students were taken outside the earth station but within the premises where various satellite C-Band, Ku-Band and Ku-Band antennas were located.

Mr. Arjun Gupta guided the students to each of these antennas and explained, in brief, their work and function. He described the significance of their position and orientation and also showed how we can move Antennas vertically and horizontally with the help of Azimuth and Elevation Angle. The students were also shown the generator systems responsible for keeping satellite system running without any hindrance.

At the end, Mr. Arjun Gupta gave a very good example of handling interferences and what's gonna happen if there is interference in the received signal. He explained about the immediate antenna setup that needs to be done during any natural calamities so as to provide basic communication and also about the antenna that is required when any VIP person comes to visit earth station to provide his safety.

At the end of each session the respective co-ordinators handled the doubts and queries of the students. Students have learned following technical points –

#### **SATELLITE EARTH STATION EQUIPMENT**

- C- Band INSAT 3C: currently in use to connect Port Blair to Yeur, Kolkata and Delhi
- Link Capacity is 34Mbps
- Intermediate Frequency used is  $70 \pm 18$  MHz i.e. 52 to 88 MHz
- Receiver Range is 3.7 to 4.2 GHz. Radar cutoff filter at receiver attenuates frequencies up to 3.6GHz with 50dB attenuation
- Trans. rejection filter prevents mixing of transmitted and received data.
- Beacon signal is measured to determine quality of signal
- Network Operation Control Central (NOCC), Sikandrabad, controls all operations
- Antenna used has diameter 11m (remote antenna has 3m diameter, primary antenna has 7.5m diameter)
- LNA used is 45° K ( remote uses 90° K LNA, Primary uses 120° K LNA)
- Antenna Control unit for tracking satellite movements, it performs a check every 30 minutes
- Antenna Movements are of two types : Azimuth and Elevation
- Beacon Tracking Receiver (BTR) works at 4187.5 MHz and its spectrum is observed using spectrum analyzer
- Bit Error Rate (BER) limit is  $10^{-6}$  (anything more, say  $10^{-5}$ , is not acceptable)
- Traffic diversion through other antenna, if something wrong happens to present antenna to maintain the communication

## INSAT SERIES

- 500 MHz Bandwidth with 24 C Band Transponders, 6 S Band Transponders, 2 Extended C Band Transponders
- Each transponder has a bandwidth of 40 MHz of which 4 MHz is used as Guard bands and the rest 36MHz is utilized for traffic
- Out of the 24 C Band Transponders, 1-12 are horizontally polarized (used for uplink) and 13-24 are vertically polarized (used for downlink)

## ANTENNA CONTROL UNIT (ACU)

- Modem uses 1+1 configuration

## STUDENT FEEDBACK

### Ashlesha Ingole:

The overall experience was good. We learned about the C and K bands. The session was started with theory and concepts were made clear. After theory it was practical time and we could relate whatever was taught in college as well as there. It was knowledgeable. Thank you for arranging such visits which help in making our concepts clear and we can apply them when needed.

### Anurag Bambardekar:

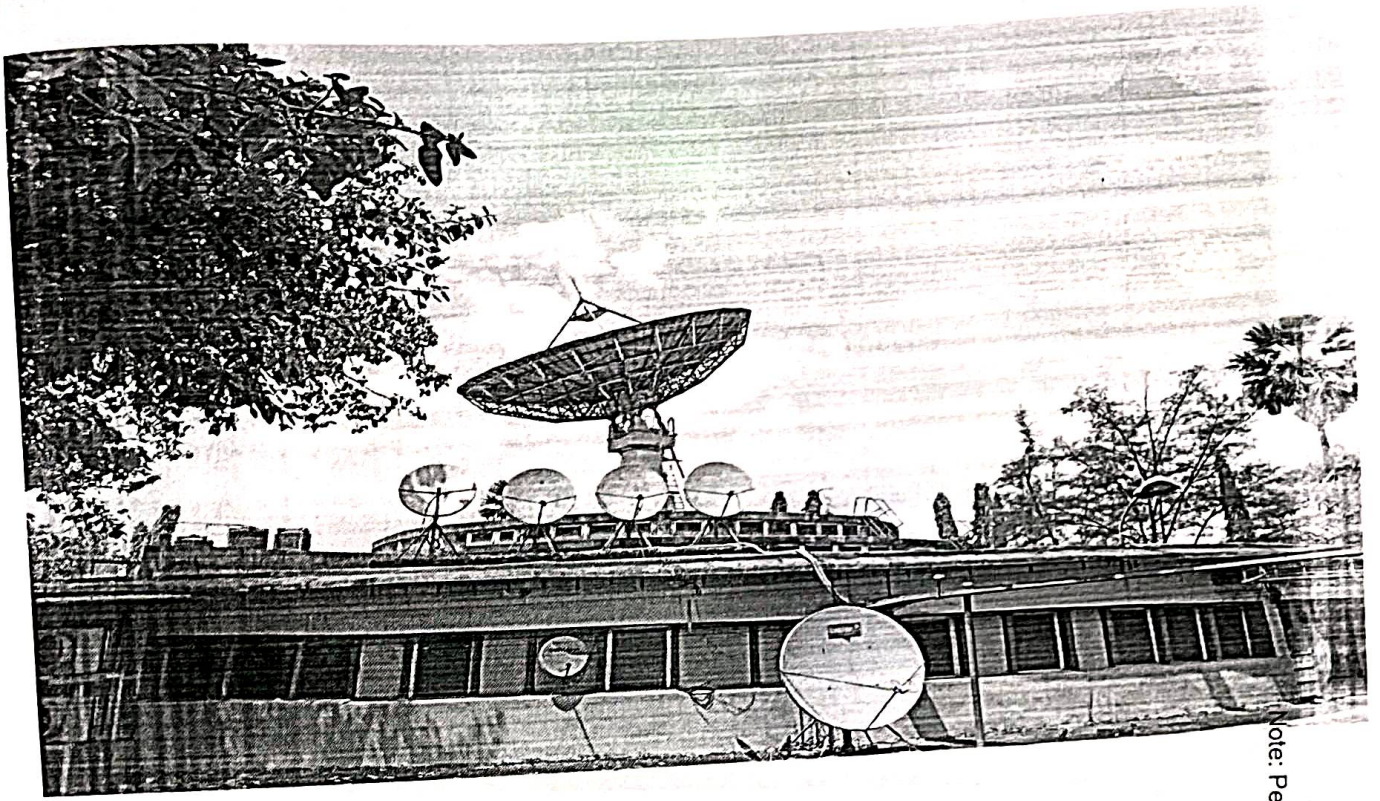
We were able to correlate curriculum with the actual on-field equipment and devices.

Although more emphasis was laid on the theory of SATCOM, it was essential for one to understand the basics in order to gain insight into the actual working of the devices.

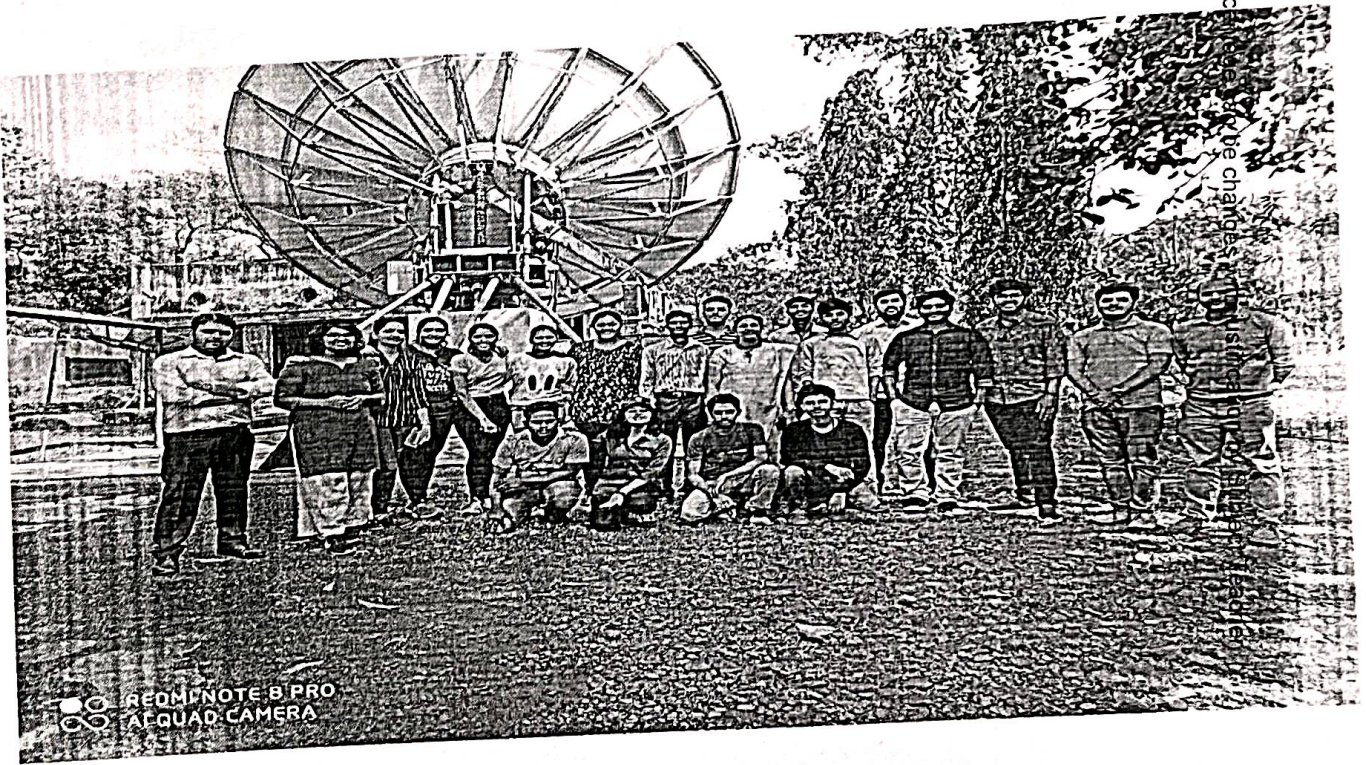
Three satellite antennas and their related equipments were shown :- IPSTAR, GSAT16, GSAT18 which use C-band and Ku-band frequencies. Their functioning was explained thoroughly and its various components were studied in a detailed manner. Devices such as antenna control unit to monitor and control azimuth and elevation angles, power systems, high power amplifiers, LNA, waveguides, etc. which are necessary for proper functioning of satellite antennas, and which were known to us beforehand, were explained by the personnel at BSNL both theoretically and practically.

PHOTOS:



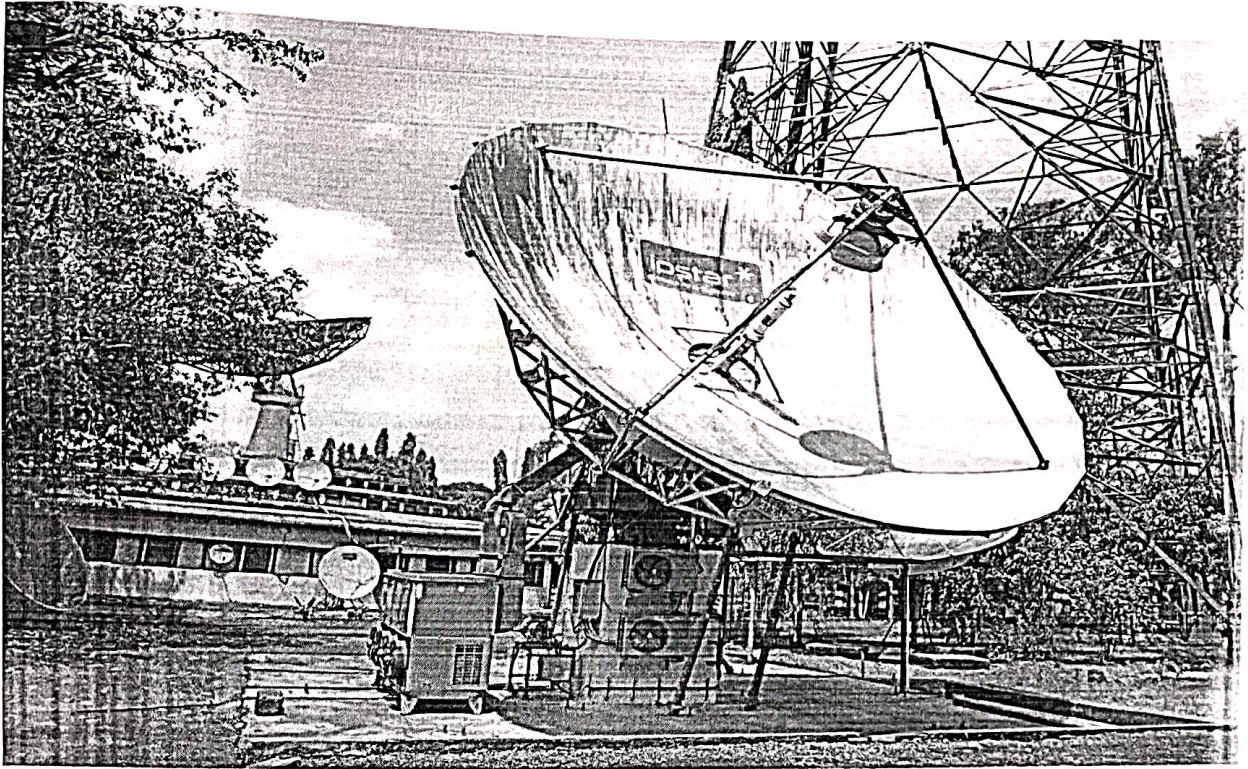


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ALQUAD CAMERA



*Shailaja*

Prof. Shailaja Udtewar

*Udtewar*

Signing Authority  
Name and Designation

*[Signature]*

Signing Authority  
Name and Designation

**Head of the Department**  
Department of Electronics and Telecommunication  
Xavier Institute of Engineering  
Mahim Causeway, Mahim (W), Mumbai - 400 016.

**PRINCIPAL**  
Xavier Institute of Engineering  
Mahim, Mumbai - 400 016.