Summer Internship 2024

Course Name: Introduction to CubeSat and Satellite Communication

Course No.	SI-2024-XX
Eligible Students to Participate	*B.Tech. 1st Yr., 2nd Yr LE*
Prerequisites	1st Yr. Engineering and Math courses
Silicon Resource Persons	Dr. Saroj Rout Prasant Swain
External Resource Persons	Dr. Chinmoy Saha *Professor, Dept. of Avionics* *Indian Institute of Space Science and Technology* Dr. Priyadarshanam *Professor, Dept. of Avionics* *Indian Institute of Space Science and Technology*
Duration of the Course	3 weeks – 100 hrs (Theory: 30 hrs, Hands-on: 30 hrs, Project Assignment: 40 hrs)
Course Outcome	A good understanding of CubeSat, a small satellite format. Basic knowledge of satellite communication. Learn basics of RF communication using LoRa protocol Learn the basics of antenna design. Setting up a TinyGS ground station
Course Content	Introduction to CubeSat Basics of satellite communication Introduction to LoRa protocol for RF communication. Introduction to antenna design. Setting up a TinyGS Ground Station
Methodology of Course Delivery	Online/Live Classroom sessions (3 hrs/day) Hands-on Lab practices (3 hrs/day) 3rd week will be 40 hours of Lab to finish the project assignment of setting up a complete ground station. A winner will be declared based on a figure of merit. The winner will display poster at the upcoming workshop on Nanotechnology and Embedded System (NES-2024).
Batch Size	30
Course Schedule	Lecture: 10-1pm, Hands-on 2-5pm
Course Fee	Rs. 4,200
Residence Fee	

Course No. SI/2024-XX

Course Name: Introduction to CubeSat and Satellite Communication

Course Details

1. Introduction to Small satellite format CubeSats
    a. CubeSat Dispenser Systems
    b. Launch Vehicles (LVs) or, Rockets.
    c. Development Process Overview: Development/Funding/Design/Regulation/GS/etc
    d. Mission Models and Requirement Sources for Launch
    e. Licensing and Flight Certification.
2. Basics of Satellite Communication
    a. Introduction to Satellite Communication
    b. Introduction to LoRa protocol
    c. Introduction to spread-spectrum communication protocol.
    d. Setting up a LoRa communication system using ESP32 platform.
3. Introduction to Antenna Design
    a. Introduction to Antenna Design
    b. Types of Antenna and their Radiation Mechanism.
    c. Antenna tuning using VNA.
4. Setting up Ground Station using the TinyGS open-source platform.
    a. Programming ESP32 platform using Platform I/O
    b. Setting up a TinyGS ground station using an ESP32 platform.
    c. Design and tune an antenna for the ground station.
    d. A group of three will design a implement their ground station. The ground stations will be judged based on figure of merit based on the density of satellites and the strength of the signal received. The final winner will present a poster during the upcoming NES-2024 workshop.