IITTNiF - GNSS Short-Term Summer Internship 2025

List of Projects

1. Design of Meta-Surfaces for GNSS/NavIC Applications

This project focuses on the design and simulation of advanced meta-surface antennas that can offer enhanced gain, reduced size, and better beam control for GNSS and NavIC frequencies. Interns will work with periodic structures, dielectric resonators, and unit-cell based meta-surface patterns using EDA tools (e.g., ADS, CST, HFSS). The final objective is to prototype a compact, high-efficiency antenna suitable for satellite navigation receivers.

2. IRS-Assisted Drone for GPS-Denied Environments

Explore the integration of Intelligent Reflecting Surfaces (IRS) on drones to provide GNSS signal redirection in GPS-denied or obstructed areas (e.g., urban canyons or indoors). This project involves a hybrid hardware-software design, with interns contributing to RF signal path optimization, drone-based platform integration, and algorithmic control of IRS elements to ensure signal continuity.

3. Modelling of TEC for EIA Using GNSS Receiver Data

This project aims to analyse GNSS dual-frequency data to model Total Electron Content (TEC) variations, particularly in the Equatorial Ionospheric Anomaly (EIA) zone. Interns will utilize tools like MATLAB or Python for preprocessing RINEX data, applying ionospheric correction models, and generating TEC maps. Applications include ionospheric forecasting and signal correction strategies for precision navigation.

4. Conformal Antenna for GNSS/NavIC Applications

Design flexible and body/vehicle-conformable antennas that can be embedded into curved or irregular surfaces, maintaining performance across GNSS/NavIC bands. Interns will explore material selection (e.g., flexible substrates), CPW or slot-fed topologies, and practical fabrication methods, with possible integration on automotive or UAV platforms.

5. 6G-GNSS RF System Design (FR3 & GNSS Bands)

Interns will investigate and design an RF front-end that supports both emerging 6G FR3 frequencies (7–24 GHz) and GNSS bands (L/S). This involves high-frequency circuit design, band-pass filtering, low-noise amplification, and dual-mode signal conditioning. This project merges communication and navigation system needs for future intelligent systems.

6. Meta-Material Based Matching Structures for L/S-Band

Design and simulation of matching circuits using meta-material-inspired unit cells (e.g., CSRR, SRR, EBG structures) to optimize the impedance profile of GNSS antennas at L and S bands. The project includes theoretical modelling, full-wave simulations, and layout optimization, enhancing radiation efficiency and bandwidth.

7. 6G Wideband Circularly Polarised RF Solutions

Design circularly polarized (CP) RF components such as patch antennas and hybrid feed networks that work across wideband 6G and GNSS frequencies. This project focuses on polarization purity, axial ratio bandwidth enhancement, and radiation efficiency, using state-of-the-art simulation tools and fabrication-ready design protocols.

8. GNSS Data Processing Solutions Using Python (Multi-Constellation Data Segregation)

Interns will develop Python-based software tools that parse, segregate, and visualize raw GNSS data from multi-constellation receivers (GPS, Galileo, GLONASS, NavIC). Tasks include implementing parsing algorithms, satellite health checking, error flagging, and basic positioning computation, with a GUI for visualization. Ideal for those interested in software-side GNSS innovation.

9. MATLAB/SystemVue Phase Shifter Designs for GNSS/NavIC

Design digital and analog phase shifter circuits using MATLAB and Keysight SystemVue for antenna array beam steering in GNSS/NavIC applications. Interns will learn phased array basics, design lumped and distributed phase shift networks, simulate linear arrays, and analyse steering angle and gain patterns under different scenarios.

10. FPGA-Based Solutions for GNSS

Implement essential GNSS signal processing functions (e.g., correlators, acquisition, tracking loops) on FPGA platforms like Xilinx or Intel. Interns will write Verilog/VHDL code, simulate it in ModelSim or Vivado, and test modules on hardware evaluation kits. The project emphasizes low-latency, real-time processing architectures suitable for embedded GNSS receivers.

Application Process

- **Last date to apply:** June 5, 2025
- **Online Orientation:** June 6, 2025
- **Internship:** June 9 – July 10, 2025

Apply now: **CLICK HERE**

Timeline:

Week	Schedule
Week 0	Online Orientation (6th June 2025)
Week 1	Project Planning, Fundamentals, Literature Survey
Week 2	Design and Simulation
Week 3	Prototype Development and coding
Week 4	Testing, optimization, and documentation
Week 5	Final validation, presentations and certification

For further details contact us at:

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