

Short Term Training Program - NI Software Defined Radio

The Department of **Electronics and Communication (Advanced Communication Technology)** organised a **Short Term Training Program** titled **NI Software Defined Radio** on **24-03-2026** at **10:45**, in **Signal Processing Laboratory (Room no. 315)**.

The resource person for the event was Mr. Murthy S, Senior Application Engineer, VVDN Technologies, Bangalore. A total of 36 students from EC(ACT) Department attended the lecture.

Objectives of the Event

The primary objectives of the event were:

- **To strengthen students' conceptual understanding of modern wireless communication systems** by connecting theoretical principles with practical, real-time demonstrations using NI SDR platforms.
- **To provide hands-on experience with industry-grade NI Software Defined Radio hardware** enabling students to implement, test, and analyse communication and signal processing algorithms.
- **To enhance students' technical readiness for careers and research** in wireless communication, embedded systems, and signal processing by exposing them to professional workflows, tools, and real-world applications.

Event Overview

The department organised a specialised training program on NI Software Defined Radio (SDR) to provide students with an immersive learning experience in modern communication systems. The session was led by Mr. Murthy S, who brought industry-grade NI SDR hardware and delivered hands-on training that enabled students to implement and analyse real-time communication and signal processing concepts. Through a blend of expert lectures, live demonstrations, and practical experiments, the event successfully bridged the gap between classroom theory and industry practices. The program empowered students with essential technical skills and exposure to professional tools, strengthening their preparedness for careers and research in wireless communication, embedded systems, and signal processing.

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Figure 1: Training program

The resource person demonstrated how the USRP Hardware Driver (UHD) acts as the primary interface for controlling and communicating with NI Ettus SDRs, allowing students to understand device configuration, data streaming, and real-time RF operations.

Students gained practical exposure to GNU Radio flowgraph design, learning how baseband processing blocks, modulation schemes, filters, and channel models can be graphically implemented and integrated with USRP devices for live transmission and reception.

The session highlighted the practical implementation of key analog and digital modulation techniques—including AM, FM, BPSK, QPSK—as well as a live demonstration of OFDM, helping students visualise spectrum behavior, constellation diagrams, and error characteristics.

An advanced segment of the training showcased how the USRP SDR platform can be configured as a 5G end-to-end testbed, illustrating concepts such as flexible PHY implementation, OFDM-based waveforms, and configurable radio parameters essential for next-generation wireless experimentation.

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Figure 2: Mr. Murthy presenting during the training program

The instructor emphasised the importance of open-source toolchains, demonstrating how GNU Radio, UHD, and third-party libraries can be combined to build modular, scalable, and research-ready communication systems.

Students were introduced to real-world workflows, including signal generation, transmission, channel observation, and performance evaluation, preparing them to approach SDR-based system design with confidence and industry relevance.

The session helped students understand how SDRs enable rapid prototyping of communication systems, reducing hardware dependency and allowing software-controlled experimentation for both academic and professional applications.

Outcomes and Impact

- **Enhanced Practical Skills in SDR Implementation:** Students gained hands-on experience with NI Ettus USRP devices, UHD, and GNU Radio, enabling them to design, simulate, and implement real-time communication systems and modulation schemes.
- **Improved Understanding of Modern Wireless Technologies:** Participants developed a strong conceptual foundation in SDR architecture, digital modulation techniques, OFDM, and the fundamentals of using SDRs as a platform for advanced technologies such as 5G testbeds.

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- **Readiness for Research and Industry Applications:** The training empowered students to work confidently with industry-standard tools and workflows, improving their preparedness for careers and research in wireless communication, embedded systems, and signal processing.

Conclusions

The training program was highly successful in bridging theoretical concepts with practical implementation, giving students real-time exposure to NI Ettus SDRs and GNU Radio. Participants gained valuable hands-on experience with modulation techniques, SDR architecture, and advanced workflows like 5G testbed experimentation. Overall, the event significantly strengthened students' technical confidence and readiness for industry-oriented wireless communication applications.

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