Electrical and Computer Engineering Department

Research Duration:	Summer 2025 (June – August 2025)
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Title of Project:	Design and Testing of a Simple Digital Communication System using Software-Defined Radio (SDR) N210

Goals and Objectives of the Project, Expectations and Outcomes

Introduction: Software-Defined Radio (SDR) is a radio communication system where traditional hardware components (like filters, amplifiers, modulators/demodulators) are replaced by software. SDR enables the testing of digital communication protocols and modulation schemes which can improve data transfer efficiency. SDRs are used in cellular networks, military communications, emergency services, satellite communications, and more. For example, in cellular communications, base stations can use SDR to support multiple standards (like 3G, 4G, 5G).

Objective: The objective of this project is to create a basic digital communication system and test its performance under various modulation schemes (e.g., Binary Phase Shift Keying - BPSK or Quadrature Phase Shift Keying - QPSK modulation).

Methodology:
- Set up the SDR N210, ensuring compatibility with a general-purpose computing device running GNU Radio (Open-source software for SDR development) or MATLAB.
- Integrate the necessary software libraries and drivers to establish control over the hardware.

Skills Gained: Modulation techniques, digital signal processing, and communication theory.

Outcome: The anticipated outcome of this project is performance evaluation of the SDR N210 system across different modulation schemes.

Broader Impact: Projects using the SDR N210 allow students to gain practical skills in digital signal processing, radio frequency (RF) communication, and software development, bridging the gap between theory and application. It provides foundational knowledge in digital communication and practical experience with modulation and demodulation.