IEEE El Paso Section

PRESENTS

National Instruments

USRP Software Defined Radio (SDR) Training

Neel Pandeya (BSEE, MSEE, IEEE, HKN) is a Principal SDR Engineer at National Instruments. His interests are in open-source software development, wireless communications; 4G/LTE 5G/NR, O-RAN; DSP and signal processing; FPGA programming; and software-defined radio (SDR). He was part-time faculty at Northeastern University. He is a co-founder and co-organizer of the New England Workshop for SDR (NEWSDR), and is a co-organizer of the GNU Radio Conference (GRCon), and the 5G Workshop at IEEE MILCOM. https://www.linkedin.com/in/neel-pandeya/

Intro to RF, wireless communications, and SDR.
Repeated twice: Wednesday February 11, 6:00 to 9:00 p.m., and Thursday February 12, 1:30 to 4:30 p.m.
After introducing RF and wireless communications, we will explore architectures for SDR radios, examine the USRP radio, and see how to program and operate it. Demonstrations and a hands-on exercise for attendees will be included. No prior experience with RF or SDR is required.

Attendees will gain a practical understanding of how to use RF, wireless communications, and SDR in various applications.

Intro to the RFNoC FPGA framework for USRP radios
Thursday February 12, from 9:00 a.m. to noon
After introducing the RF Network-on-Chip (RFNoC) FPGA framework for USRP radios with demonstrations, we will do a walk-through implementation of a new user-defined RFNoC into both UHD and GNU Radio. RFNoC enables USRP FPGA programming of custom FPGA-based algorithms into the signal processing chain of USRP radios. FPGA-accelerated SDR applications can chain multiple RFNoC Blocks together and integrate them into both C++ and Python programs using the UHD API, and into GNU Radio flowgraphs.

Attendees will gain a practical understanding of how to use the RFNoC framework for custom FPGA processing on USRPs.

USRP SDR hardware and software toolchain.
Friday, February 13, 9:00 a.m. – 5:00 p.m.
This session will provide a hands-on introduction to the USRP SDR hardware and the open-source software toolchain (Linux, C++, Python, UHD, and GNU Radio). Attendees should have a basic understanding of Linux and its command line, wireless communications, and basic Python and C++. **Topics:** • USRP SDR hardware and architecture. • Getting started with a USRP device. • Using the UHD driver and GNU Radio framework. • USRP programming in C++ with the UHD API. • Creating and running flowgraphs with GRC and Python. • Viewing packetized I/Q data with Wireshark. • Managing USRP FPGA images. • USRP best-practices, and more.

Attendees will gain a practical understanding of how to configure, operate, and program an USRP to implement a wide range of wireless systems and applications.

Implementing a 3GPP-compliant 5G/NR testbed using a USRP radio
Saturday February 14, 10:00 a.m. to 4:00 p.m.
This tutorial will show how to implement a 3GPP-compliant 5G/NR testbed using a USRP radio with the open-source software stacks, srsRAN from Software Radio Systems (SRS), and OpenAirInterface (OAI) from Eurecom, for research, development, and prototyping.
Attendees will gain a practical understanding of how to use USRP devices to implement 5G/NR wireless networks.

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