TOP LOC 282023 Waveform

Welcome to the "Waveform" course offerd in cooperation with the Medipol University in Istanbul / Turkey.

In this program, we'll explore the fundamental concepts, design principles, and applications of waveforms and multiple access techniques in wireless communication. We'll review the wireless channel, understand waveform representations, and trace the historical development of waveforms. Orthogonal and non-orthogonal concepts will be explored, along with multicarrier versus single carrier waveforms. Discover the versatility of Orthogonal Frequency Division Multiplexing (OFDM), its advantages, and applications. We'll cover channel equalization, synchronization, and pilot designs. Explore the future of waveform design and its impact on wireless communications. Join us on this journey to gain insights into advanced waveform designs and the potential of waveforms to shape the future of connectivity.

Target Group

Engineers, Technicians and Administrators

Your Benefits

By the end of the "Waveform" course, participants will:

- Understand the principles and fundamentals of waveforms in wireless communication.
- Grasp the representation of waveforms in different domains.
- Evaluate the historical development of waveforms and multiple access techniques.
- Differentiate between orthogonal and non-orthogonal concepts.
- Analyze advantages and limitations of multicarrier and single carrier waveforms.
- Gain comprehensive knowledge of OFDM and its applications. ? Explore channel equalization techniques and synchronization in OFDM.
- Examine future concepts in waveform design, including mm-Wave and flexible waveforms.
- Address practical challenges in waveforms, such as PAPR and sidelobes.
- Develop an informed approach to waveform selection and design for wireless communication systems.

By the conclusion of this course, participants will possess a comprehensive understanding of waveforms and multiple access techniques, enabling them to make informed decisions in designing and deploying efficient wireless communication systems in various real-world applications.

Methods

Instructor Leader Led/ILL: Physical classroom environment

Key Features

- Introduction to Waveform
  - Review of wireless channel
  - Waveform and multiple access
  - Waveform representation in different domains
  - Waveform and multiple accessing history
  - Orthogonal and non-orthogonal concepts
  - Multicarrier versus single carrier waveforms
- Channel Equalization
  - Time domain equalization
  - Frequency domain equalization

- Introduction to OFDM and Multi-Carrier Modulation
  - Impact of CP and guard interval
  - Pulse shaping (prototype filters)
  - ICI and ISI handling
  - Advantages of OFDM
  - Applications of OFDM
  - Coding and Interleaving in OFDM
  - Channel estimation and equalization in OFDM
  - Pilot and preamble designs in OFDM
  - Scheduling in OFDMA
  - Adaptive, Flexible, Cognitive OFDM
  - OFDM-MIMO
  - OFDM sidelobes and sidelobe reduction techniques
  - OFDM standards and design parameters
  - Optimal OFDM system design
- OFDM problems
  - PAPR
  - Sidelobes and out of band radiation
  - Loss of orthogonality and ICI (phase noise, frequency offset, Doppler spread)
  - Ranging and synchronization requirement in OFDM
  - Impact of asynchronous transmission in OFDM
  - RF Impairments
- Other Important Waveforms
  - SC-FDE
  - SC-FDMA
  - DFT-s-OFDM
  - Unique word OFDM
  - UW DFT-s-OFDM
  - Zero tail OFDM
  - Zero tail DFT-s-OFDM
  - OTFS
  - OFDM-IM
  - FMCW
- Future concepts in Waveform:
  - mm-Wave waveform design (SC versus MC in mm-wave)
  - Hybrid waveforms
  - Flexible waveforms
  - Dual/multi-function waveforms (same waveform for different goals)
  - Non-orthogonal waveform design
  - Differential modulation (non-coherent modulation) in OFDM (minimal pilot OFDM design)
  - PHY security in OFDM (secure OFDM design)
  - Other secure waveforms and comparison with OFDM
  - Waveform design suitable for symbiotic radios

Events

Dates on request / Language: English, Turkish

Duration

5 Days

Customized training

We tailor the content and duration of the trainings according to your individual needs.

Certificate

TOP Certification

Contact Person

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