AFRICAN ADVANCED LEVEL TELECOMMUNICATIONS INSTITUTE (AFRALTI)

TRAINING WORKSHOP OUTLINE

Title:	Wireless & Broadcast Technologies
Dates:	7th-18th May 2018
Duration:	10 days
Venue:	Nairobi, Kenya

Course Overview: This module introduces and provides an understanding of communication networks, wireless communication technology, wireless networking, wireless LANs. Various aspects of wireless networking will be covered including: fundamentals of cellular communication, mobile radio propagation, multiple access techniques, and mobility support, channel allocation, Wireless PAN/LAN/MAN standards, mobile ad-hoc networks, wireless sensor networks, and routing in wireless and mobile networks. This course will also cover broadcast technologies and demonstrate how they offload mobile networks.

Target Audience: Engineers / Technicians /Network Designers & Planners / Design & Deployment Engineers/ Network Integration & Operations Engineers/Telecom Regulators

Pre-requisite/s: Basic understanding of RF, telecommunications systems and data networks

Pain Points: With advancements in wireless technologies, there is need to understand how new technologies will fit in the ecosystem and the regulatory challenges they will present.

Value Proposition: This course will help participants understand, analyze and perform technical, business and regulation analysis for wireless and broadcast technologies.

Methodology: Presentation slides and videos

Workshop Objectives: To provide an understanding of wireless and broadcast technologies and how they provide for mobility and flexibility in telecommunications engineering as well as the challenges they present.

Workshop Learning Outcomes:
➢ Perform technical, business and regulation analysis for wireless and broadcast technologies.
➢ Outline the challenges of implementing wireless and broadcast technologies
➢ Understand the technical details of wireless and mobile communication;
➢ Differentiate cellular networks and cordless networks from other wireless networks;
➢ Determine and apply appropriate communication techniques in mobile networks and wireless LAN

Workshop Contents/Topics:

- **Wireless Networks**
    o Wireless LANs, PANs and WANs (in addition to LAN above)
    o LAN, PAN, WAN and interconnection to Internet (via gateways, TCP/IP protocol suite – discuss common protocols like HTTP, TCP, UDP, FTP, DHCP, etc)
    o Introduction to IEEE 802.11x
    o WiFi, WiMax, Bluetooth and ZigBee technologies (include 6LoWPANs and LPWAN and the IEEE 802.15.4 standard)
    o Cognitive radio (including **TV White Spaces** for both point to point and point to multipoint)
    o Mobile Ad Hoc Networks and Wireless Sensor Networks including protocols therein.
    o Fundamentals of cellular communications (cellular meaning, technologies (2G, EDGE, 3G, etc), BS types (macro, micro, pico, femto), practical deployment strategies (homogeneous, heterogeneous) and their implications on interference management, channel allocation (co-band or different bands), 900/1800 overlay/underlay, hexagonal cellular structure for analysis vs. actual propagation, etc.
    o Implications of energy consumption to wireless communication especially mobile networks – greenhouse gas emissions (we have to be careful), limiting revenues, and so on. How do we reduce energy consumption? Using more efficient equipment, deployment strategies that are better (reducing BS density), etc. With 5G and future networks, density increases greatly – implications on capacity, frequency reuse and energy consumption.
    o Routing in mobile networks.
    o Mobile radio propagation – techniques (reflection, diffraction, scattering); models (large scale and small scale, indoor, analytical, empirical); LOS and NLOS links (Fresnel zones and their clearance); Link budget (including pathloss, system losses, rain fading, atmospheric fading);
    o Interference and management (do in terms of Mobile cellular) – co-channel and adjacent channel, frequency planning (frequency reuse and channel allocation)
    o Antennas (directional, sectoral, omni, dipole, isotropic); properties (radiation patterns, HPBW, reciprocity, polarisation, gain, etc);

- Multiple access techniques (FDMA, CDMA, TDMA, Space-DMA, polarisation-DMA) and their multiplexing counterparts
- Introduction to MIMO (for space diversity)
- Coding and modulation issues (why we modulate, intermediate frequency (why?), why we code? Adaptive modulation and coding
- SINR, SNR and their meaning to capacity.
- Noise issues and their capacity limitation

- **Mobile broadcast technology**
  - Terrestrial Broadcast (TV & Radio)
  - Satellite Radio
  - Satellite Television (DTH)
  - Mobile Broadcast; Offloading mobile networks
  - Digital Video Broadcast – Handheld (DVB-H) & DVB-SH
  - Broadcast Regulation And FCC Policy Decisions; A brief on TV white spaces (discuss this with cognitive radio)

For more information, please contact us on
Tel: +254 710 207 061, +254 733 444 421
training@afralti.org or info@afralti.org
www.afralti.org