

Course Outline

Module 1: Introduction to Wireless Communications

- Common terminologies
- History of wireless communication
- Wired vs. wireless networks
- Types of wireless networks: Based on connection
- Types of wireless networks: Based on geographical area covered
 - WLAN
 - WWAN
 - WPAN
 - WMAN
 - Comparison Between WLAN, WWAN, WPAN and WMAN
- Advantages and Disadvantages of wireless networks
- Limitations of wireless networks
- Generations of wireless technology
 - 2 G
 - 2.5 G
 - 3 G
 - 4 G
- Uses of wireless technology
 - Satellite
 - Cellular phone networks
 - Laptop
 - PDA
 - Blackberry
 - Remote control
 - M-Commerce

Module 2: Wireless Signal Propagation

- Common terminologies
- Analog and digital signals
- Radio waves
- Infrared light
- Transmission Speed
- Components of a Radio system
 - Filter
 - Mixer
 - Amplifier
- Transmission Direction
 - Simplex Transmission
 - Half-Duplex Transmission
 - Full-Duplex Transmission
- Switching
- Signal strength
- UWB
- Modulation
 - Analog modulation
 - Amplitude modulation
 - Frequency modulation
 - Phase modulation
 - Digital modulation
 - Amplitude Shift Keying

- Frequency Shift Keying
 - Phase Shift Keying
- Spread Spectrum
 - Frequency Hoping Spread Spectrum
 - Direct Sequence Spread Spectrum

Module 3: IEEE and ETSI Wireless Standards

- Common terminologies
- Institutes offering Wireless Communication Standards
- IEEE
- IEEE Standards
- 802. Architecture
- 802.1X
- 802.11
 - 802.11 (Wi-Fi Standard)
 - Architecture
 - 802.11 Standards
 - 802.11a
 - 802.11b
 - 802.11e
 - 802.11g
 - 802.11h
 - 802.11i
 - 802.11j/ 802.11k
 - 802.11m/ 802.11n
- 802.15
- 802.16
 - Wi-MAX
- P1451.5
- ETSI Standards
- HIPERLAN
 - HIPERLAN/1
 - HIPERLAN/2
 - HiperAccess
 - HiperLink
- HIPERMAN

Module 4: WLANs and Operations

- Introduction to WLAN
- Advantages of using WLAN
- Basic components of a WLAN
- How to access a WLAN
- Types of WLAN
 - Ad Hoc networks
 - Mobile Ad Hoc Networks (MANET)
 - Infrastructure networks
 - Repeater networks
 - Bridged networks
 - Mesh networks
 - Enterprise Wireless Gateway networks
 - Enterprise Encryption Gateway networks
 - Virtual AP networks
 - WLAN Array
- Roaming

- Steps for Association
 - Steps for Re-association
- Campus Topologies
- Virtual LAN
- Distributed Coordination Function/ Enhanced DCF
- Transmission Opportunity (TXOP)
- Proxy Mobile IP
- WLAN Management
- Setting up a WLAN
- Configuring WLAN: Prerequisites
 - Configure Computers For Automatic Addressing
 - Enable Automatic Wireless Network Configuration
- Run the Wireless Network Setup Wizard
- Configuring Firewall on WLAN
- Connecting to an Available Wireless Network
- WLAN Security: Passphrase
- Troubleshooting WLAN
- WLAN Diagnostic Tool: CommView for WiFi PPC
- WLAN Diagnostic Tool: AirMagnet Handheld Analyzer

Module 5: Wireless Technologies

- Common terminologies
- Wireless Technologies
- IrDA
- Bluetooth
- Wi-Fi
 - Hotspot
- GSM
 - GPRS
 - EDGE
- FDMA
- TDMA
- CDMA
- CDMA vs. TDMA
- ZigBee
 - Stack Architecture
 - Devices
 - Network Model
 - Characteristics
 - Benefits
 - Security Issues
- Voice over WLAN (VoWLAN)
 - VoWLAN Call Routing
 - Characteristics
 - Benefits
 - Limitations
- Unlicensed Mobile Access (UMA)
- Fixed wireless broadband technologies
 - LMDS
 - MMDS
 - LMDS vs. MMDS
- IDEN
- CDPD
- HSCSD
- PDC-P

- FRS and GMRS
- BSS and IBSS
- HPNA and Powerline Ethernet

Module 6: Wireless Protocols and Communication Languages

- Common terminologies
- Wireless protocols
 - WAP
 - WAP micro browser
 - WAP model
 - TKIP
 - SWAP
 - EAP
 - LEAP
 - PEAP
 - LDAP
 - RADIUS
 - WRAP and HDTP
 - CCMP
 - SIP
 - SOAP
 - RSN
- Programming languages used for wireless communication
 - J2ME
 - CLDC
 - MIDP
 - WML
 - BREW
 - cHTML
 - HDML
 - VoiceXML

Module 7: Wireless Devices

- Common terminologies
- Wireless Infrastructure
- Antennas
 - Types
 - Directional/ Omnidirectional Antenna
 - Aperture Antennas/ Leaky-wave Antennas
 - Reflector Antennas
 - Antenna Functions
 - Antenna Characteristics
- Access points
 - Operating modes of access points
- PC Cards
- Wireless Cards
- Wireless Modem
- Wireless Router
- Using a Wireless Router as an Access Point
- Wireless USB
- Wireless IP Phone
- Wireless Game Adapter
- Wireless Print Server
- Wireless Range Extender

- Wireless Internet Video Cameras
- Bluetooth Connectivity Devices: Air2Net Bluetooth PC Card
- Bluetooth Connectivity Devices: Bluetooth Combo Print Adapter
- Wireless VoIP Gateway: AH1038
- Wireless Media Gateway: WMG80
- Wireless Presentation Gateway: D-Link DPG-2000W
- Hotspot Gateway
- GSM Network Devices
 - Mobile Station
 - MexE
 - Base Station Subsystem (BSS)
 - Base Station Controller (BSC)
 - Base Transceiver Station (BTS)
 - Network Subsystem
 - Mobile Switching Center
 - Mobile Switching Center Databases
- Add Wireless To A Wired Network

Module 8: Fundamentals of RFID

- Case Study
- RFID
- Components of RFID Systems
 - RFID System Architecture
 - RFID Tags
 - Passive RFID Tags
 - Active RFID Tags
 - RFID Tag Reader and Antenna
 - RFID Controller, Premises Server and Integration Server
- Chipless RFID Tag
- RFID Stations
- RFID Frequencies
- Applications of RFID Systems
- RFID Standards
 - ISO RFID Standards
 - EPC Standards
- RFID Collisions
- RFID Security and Privacy Threats
 - Protection Against RFID Attacks
- RFID Malware
 - RFID Exploits
 - Defending Against RFID Malware
- RFID Security
- RFID and Privacy Issues
- RFID Vendors

Module 9: Wireless Security

- Wired vs. wireless networks
- Business and wireless attacks
- Types of wireless attacks
 - Man-in-the-middle attack
 - Denial-of-service attack
- Terminology
- War Chalking
- WEP

- Cracking WEP
- WEP Tool: WEPCrack
- SSID
 - Beacon frames
 - Authentication modes
- MAC Address
 - MAC sniffing and AP spoofing
 - Tool: Wellenreiter V2
- Rogue Access Points
- Stream ciphers
 - PAD collection attacks
- Steps for hacking wireless networks
 - Tool: NetStumbler
 - Tool: Kismet
 - WEP Tool: AirSnort
- WPA
- DMZ
- MIC
- WTLS
- Mobile security through certificates
- Certificate management through public key infrastructure (PKI)
- Tool: Wifiscanner
- Tool: BTScanner
- Wireless network security checklist
- Securing wireless networks