Hands-On

# Wireless Networking for Telecom Technicians

## Course Description

This extensive Hands-On course is a must for persons entering the field of WiFi Networking and Telecommunications. Students will learn about the building blocks of all networks, including the OSI and Network Models. Many terms will be defined, including the purpose of switches, routers and WiFi access-points and more.

The course will also provide significant Hands-On with networking equipment and components, including test equipment. Copper, fiber and WiFi media will be demonstrated, including updates to all technologies. We will also cover Mesh technologies with wireless and wired backhaul links will be covered, along with multiple ways to mitigate interference.

Finally, troubleshooting of common problems will be discussed for different network medias, including Real-World examples, plus any examples and or issues provided by the customer/attendees to help them immediately improve their WiFi Networking skills.

## Students Will Learn

- **General Networking Terminology**
- **OSI & Network Models**
- **LANs & WLANs**
- **MAC & IP Addressing**
- **2.4G vs. 5G ISM Bands**
- **Wireless Router Features**
- **Mesh Networks**
- **Security Fundamentals**
- **Test Equipment Network Analyzer, WiFi Analyzer, TDR, Spectrum Analyzer**
- **Troubleshooting Wi-Fi**
- **and much more...**

## Target Audience

Anyone entering the telecom, communications, electrical and/or other industries relying on WiFi networking.

## Prerequisites

None.

## Course Outline

Introduction : Networking Fundamentals
- What is TCP/IP?
- Internet vs. Intranet
- Protocols & Layers
- OSI Model vs. Network Model
- Data Transfer Through A Network
- Data & Traffic Types, CoS
- Meshed Networks

Module 1 : Layer 1 & Media Types
- Early Networks, Point-to-Point/Ad Hoc
- Repeaters & Hubs
- Collision Domains
- Copper Media:
  - 8P8C, RJ45, RJ48
  - T568-A/B, Straight vs. Crossover
- Optical Media:
  - MMF, SMF
  - Transceivers
  - Splices, Reflections, Loss, OTDR
  - Connector Types, Ferrules: UPC & APC
- Radio Signals:
  - RF Spectrum
  - ISM Bands, 2.4GHz & 5GHz
  - IEEE 802.11, Wi-Fi4-6E (7.5GHz)
  - Propagation & Interference
  - Links & Backhaul

Module 2 : Layer 2 & Wireless WLANs
- Local Area Networks
- Switches & Layer 2 Frames
- SSID, BSSID, PHY, MIMO, MU-MIMO, Mesh
- IEEE 802.11 & ISM Bands

- 802.11xx vs. Wi-FI4, 5, 6, 6E
- 2.4GHz, 5GHz, 7.5GHz channels, DFS
- Beamforming, MIMO, Frame Coloring
- Security Protocols: WPA, WPA2, WPA3
- Wireless AP vs. Wireless Router
- Antenna Types
- Cisco, Juniper and/or Ubiquiti examples
- Interference
- Wi-Fi Network Analyzers

Module 3 : Layer 3 & Routing
- IP Addressing
- Networks & Hosts, Class A thru E
- Network ID
- Public vs. Private & NAT
- Reserved Addresses
- Dividing Networks with Routers
- Routing Tables & Routing Protocols
- Subnetting & Masks, Prefix Notation
- IPv4 vs. IPv6
- DHCP, DNS
- Wireless Router Features:
  - 2.4G & 5G bands
  - DFS
  - Firewalls & Port Forwarding
  - NAT
  - Passwords & Security

Module 4 : Layer 4 & Ports
- Ports, Sockets
- Reliability vs. Speed: UDP, TCP
- Acknowledgements, Timeouts
- Connection Oriented, Connectionless
- Full-Association, Half-Association
- PAT vs. NAT

Module 5 : Security
- Wi-FI Frame Interception
- Encryption
- WPA2 vs. WPA3
- Mobile CCSS7 Hack
- VLAN/Switch attacks
- Port Shutdown
- Firewalls & Ports
- Downloads & Ransomware

Module 6 : Troubleshooting
- Troubleshooting Techniques: Verify, Symptom Matching, D&C, Info Gathering, etc.
- Shell commands: ipconfig/ifconfig, ping, arp, netstat, tracert/traceroute, hostname
- Wi-Fi: Obstacles, Signal Strength, Reflections, Channels, Wi-Fi6, Legacy Devices
- Test Equipment: Wi-Fi Analyzers (Fluke, Viavi, etc.), DMMs, Mobile Apps

- Best Practices: Placement, Separate SSIDs/Radios, 2.4G vs. 5G, Interference Sources
- Examples

## Notes

This course can be delivered in a 2 to 2 1/2 -day format based on topics covered. This course can also be combined with other courses such as our Advanced Network Troubleshooting or Advanced WiFi Troubleshooting for a customized curriculum upon request.

## Delivery Method

Instructor-Led with numerous exercises throughout.

## Equipment Requirements

**(This apply's to our hands-on courses only)**

BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

## Course Length

3 Days