

## Course Description

This course teaches installation and troubleshooting technicians the key elements needed for installing, testing and maintaining antennas and masts.

The course introduces the elementary principles of radio used in all classes of service. It teaches what kinds of antenna systems exist and which offer advantages for particular applications. Siting masts is becoming more difficult and so it has become necessary to share masts where possible and also to share antennas. Methods for achieving this will be considered. However within built-up areas or areas of natural beauty new masts may need to be concealed or located in less than optimal locations. The course will address these issues and provide potential solutions.

## Students Will Learn

- Recognize Different Classes Of Antenna Tower And Plant
- Recognize And Select Appropriate Cables And Antenna Connections
- Advise On Antenna Sharing And Location
- Appreciate Wind Loading And Mast Design Parameters
- Troubleshoot Link Problems
- And More...

## Target Audience

This course is geared for installation and troubleshooting technicians.

## Prerequisites

This course assumes attendees already have basic knowledge of data communications, PCs and IP systems. No prior knowledge of radio or Wireless systems will be assumed.

## Course Outline

### Module I: Radio Principles

Radio Transmission Principles

Radio Propagation

Signal Power and Free Space Loss

Effective Radiated Power (ERP)

Polarization

Absorption

Diffraction

Reflection

Signal to Noise Ratio

Cell Based operation

Carrier interference noise

Interference effects and Fading

MiMo and SiSo

Modulation

Amplitude, Frequency and Phase Modulation

QAM

Multi-Access Systems

FDM, TDM, TDMA, FHSS, DSSS, OFDM, CDMA

Frequency use

Overlapping channels

Noise and signal strength

Operating Speed and multi-standard selection

Configuring Access Points

## Module II: Antenna Systems

Classes of Antennas

Antenna designs

Antenna Arrays: Adcock, collinear,

All Frequency Antennas: AWX

Omni-Directional Systems: Choke Ring, Mono-pole, Biconical, Disconcial, Folded unipole, Mast Radiator antenna

High-gain antenna (HGA) Concepts

Directional Systems: Cassegrain, BUD, Offset Dish, Catinna,

Beverage Antennas: Dipole, Log-Periodic, Yaggi, Helical

Loop Antennas

Engineering the Beam Shape: Fan-beam antenna

Increasing Antenna Gain: Quad antenna

Antenna Bandwidth

Antenna Polarization Characteristics

Wide Band Antennas: Fractal antenna, Tilted Terminated Folded Dipole

Mobile Network Antennas: Sector, Panel, Vivaldi, Whip, Smart, Blister, Patch

Leaky Coax Antenna Systems

Shortwave relay station

Selecting the appropriate types

Point-to-point services

Area Coverage

Cellular coverage

Indoor and mobile applications

Towers and Mountings

Static Mounts

Camouflaged Antennas: Artificial Trees, Roof-Top, Street Furniture

Loading and support

Raw Poles

Guyed Poles

Case Study Selecting Types of Antenna

Module III: Cable Plant

Digital Interfaces

Cable transmission fundamentals

Twisted pair Cables

Coaxial Cables Characteristics

Characteristic Impedance

RF Cable Signal Loss and Noise

Reflections and termination

Cable loss and noise

Splitters, Taps, Line Amplifiers, Attenuators and Connections

Optical Cables

Engineering Antenna Cable Feeds

Case Study Engineering Cable Plant

## Module IV: RF Link and System Considerations

Key Specification Parameters

Frequency Selection

Transmission Path Loss calculation

Calculating the Antenna Height Required

Allowing for obstructions

Allowing for Interference

Feeder Loss

Allocating the Link Budget

Matching the receiver sensitivity

## Evaluation and Review

## Delivery Method

Instructor-Led with numerous case-studies and Hands-On exercises.

## 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

2 Days