MICROWAVE RADIO TRANSMISSION ENGINEERING COURSE OUTLINE

COURSE FEE: 50K

Objectives

Understand basic fundamental concepts about microwave radio transmission, planning and Implementation, essential parts of microwave radio systems and microwave communications applications

Who Should Attend

The course is designed for Technicians, Engineers and planners who want to elevate HIS/HER Microwave radio Transmission Engineering skills.

Prerequisites

Participant should have a fundamental or basic understanding of wireless communications and data networking.

Duration: 4 Weeks

MODULE 1

Microwave Communication Overview

Basic Concepts of Digital Microwave
Microwave Development Course
Microwave Evolution in the World
Microwave Evolution in China
Characteristics of Digital Radio Communication System
Challenges and Opportunities for Digital Microwave Communication
Optical Fiber Communication—Biggest Challenge for Digital Microwave Communication
Opportunities for Digital Microwave Communication
Microwave Frequency Band Choice and RF Channel Arrangements
Digital Microwave Communication System Model
Modulation Method of Digital Microwave
Channel Utilization of Each Modulation
Digital Microwave Frame Structure
Conclusion

MODULE 2

Introduction to Digital Microwave Equipment

Digital Microwave Equipment Classification
Microwave antenna and feeder

Microwave antenna
Classification of Microwave Antennas
Feeder System
Branching System
Outdoor unit (ODU)
Constituents of Digital Microwave Transmitter and Major Performance Indexes
Constituents and Major Indexes of Receiver
Indoor Unit
Installation and Adjustment of Split Microwave System
Conclusion

MODULE 3

Microwave System Networking and Application

Microwave System Typical Networking Modes and Station Types
Typical Networking Modes
Microwave Station Types
Relay Station
Passive Repeater Station
Active Repeater Station
Digital Microwave Application
Conclusion

MODULE 4

Microwave Propagation Theory

Electric Wave Propagation in Free Space
Free Space
Propagation Loss of Electric Waves in Free Space
Influence of Ground Reflection on the Electric Wave Propagation
Concept of Fresnel Zone
Influence of Ground Reflection on Receiving Level
Influence of Troposphere on Electric Wave
Ray Bend in Atmosphere
Concept of Equivalent Earth Radius
Refraction
The Meaning of K Value in Engineering Design
Fading caused by Several Atmospheric and Earth Effects
Fading Types
Influence of Troposphere on Electric Wave Propagation
Fading Rules (microwave frequency bands lower than 10 GHz
Frequency Selective Fading
Multi-path Propagation of Electric Waves
Influence of Frequency Selective Fading on Transmission Quality of Microwave Communication Systems
Statistic Feature of Fading
Microwave Fading Model
Engineering Calculation of Fading
Conclusion

MODULE 5

Anti-Fading Technology in Digital Microwave Equipment

Overview
Purposes of Taking Anti-Fading Measures
Classification of Anti-Fading Measures
Evaluation on Anti-Fading Measures
Adaptive Equalization

AFE
ATE
Cross-Polarization Interference Counteracter (XPIC)
Automatic Transmit Power Control (ATPC
Diversity Reception
Classification of Diversity Reception
Description of Space Diversity
Compound Mode of Diversity Signals
Microwave Equipment Protection Mode
HSM
HSB
Classification of Digital Microwave Equipment Protection Modes
Interference and Main Methods against Interference
Interference Source
Basic Methods of Communication System against Interference
Conclusion

MODULE 6

Digital Microwave Engineering Calculation

Overview
Microwave Path Parameter Calculation
Microwave Station Antenna Communication Azimuth Calculation
Calculation of Path Distance
Calculation of Elevation and Minus Angles
Calculation of Clearance
Calculation of Reflection Point
Determining Antenna Gain
Calculation of Microwave Circuit Index
Calculation of Receiving Level and Flat Fading Margin
Calculation of Interference Level
Calculation of Diversity Receiving Parameter
Calculation of Circuit Interruption Rate
Rain Fading
Gas Absorption
Conclusion

MODULE 7

Microwave Engineering Design Requirement

Basic Requirement of Microwave Path and Cross-section Design
Cross Section and Station Distance
Clearance Standard
Antenna Height and Space Diversity Distance
Selecting Microwave Band and Configuring Polarization
Selecting Microwave Band
Arrangement of Microwave Frequency and Polarization
Technical Requirement of Digital Microwave Relay Communication Engineering Design
PDH Microwave Engineering Design Technical Requirement
SDH Microwave Engineering Design Technical Requirement
Access Network Technical Requirement—26 GHz Local Multiple-point Distribution
System (LMDS
Access Network Technical Requirement—3.5 GHz Fixed Radio Access
Conclusion

MODULE 8

Microwave Engineering Design

Design Method
Overview
Route, Site and Antenna Height
Frequency Selection and Polarization Arrangement
Circuit Performance Estimate
Design Example
SDH Microwave Circuit
SDH Microwave Site Type and Polarization Configuration
Conclusion

MODULE 9

Precautions in Engineering Design

Equipment Layout
Installation of Microwave Antenna
Process Requirement for the Tower
Process Requirement of New Established Tower
Orientation Requirement of Newly Established Tower
Requirement for Old Tower to be used
Conclusion

MODULE 10

Practicals

Configuration of radio links
E1 mapping and Cross-connection
Ethernet over PDH Traffic routing
1+1 HSB Implementation
1+1 SD,FD and Media Diversity
DCN over E1 or SDH
2x(n+1) XPIC
4+0 XPIC config
Native Ethernet Layer 1 Traffic Routing
1+0 non protected MW link
Qos
MW radio Performance Monitoring
E1,STM1 and RF loopback test
E1/optical BER test