

Training: Compendium CE  
Planning Digital Microwave Point-to-Point Systems

FORM OF TRAINING	MATERIALS	PRICE	DURATION
Traditional	Hardcopy	700 EUR	2 days
Traditional	Digital materials	700 EUR	2 days
Traditional	CTAB Tablet	850 EUR	2 days

## LOCATIONS

Krakow - 5 Tatarska Street, II floor, hours: 9:00 am - 4:00 pm

Warsaw - 17 Bielska Street, hours: 9:00 am - 4:00 pm

## TRAINING GOALS:

This two-day long training event introduces design process of digital microwave point-to-point systems. Such systems are widely used by fixed and mobile telephony operators as well as for military purposes. During this course attendees obtain necessary theory and study detailed aspects of planning process. The most important parts of the course cover the following subjects: radiowave propagation theory, types of fading, parameters and configuration of radio equipment (antennas, waveguides, modems), frequency planning, interference conditions and link budget. Finally, the course also presents a detailed case-study example which summarizes the knowledge provided.

Target Audience - Who Should Attend and Benefit

This course is addressed to individuals responsible for planning, engineering, operating and maintaining digital microwave point-to-point radio systems. Practical and theoretical knowledge would be valuable for both technical professionals and engineers.

## CONSPECT:

- Introduction to Digital Microwave Systems
  - Frequencies
  - System Components
  - Applications
- Transmission Methods
  - Digital Modulation Techniques
  - Error Detection and Error Correction
- Microwave Propagation

- Free Space Propagation
- Atmospheric Effects on Propagation
- Attenuation Due to Atmospheric Gases
- Refraction in Troposphere
- Diffraction Due to Obstacles
- Types of Fading
  - Rain Fading
  - Multipath Fading
- Radio Equipment
  - Types and Parameters of Antennas
  - Waveguide Characteristics
  - Transmitter and Receiver Characteristics
- Equipment Configurations
  - Indoor/Outdoor Mounting
  - Diversity and Branching Schemes
- Frequency Planning
  - Frequency Bands Assigned to Point-to-Point Radio Links
  - Interferences
  - Frequency Coordination
  - Frequency Re-Use
- Reliability and Quality Standards
- Radio Path Planning
  - Network Topologies
  - Line-of-Sight (LOS) Requirements
  - Path Profiles
  - Path and Site Surveys
- Link Design
  - Choosing Antenna Heights (Including Reflection Point Calculations)
  - Power Budget and Fade Margin
  - Outage Predictions (Due to Rain and Multipath Fading)
- Tutorial Example
  - Initial Requirements
  - Calculation Results
  - Discussion

## REQUIREMENTS:

- Ability to understand technical subjects. Some familiarity with basic algebra would be helpful.
- Technical background in telecommunications would also be an advantage when attending this course.
- A scientific handheld calculator or a laptop is recommended due to some working exercises.

## Difficulty level



## CERTIFICATE:

The participants will obtain certificates signed by Compendium CE.

## TRAINER:

Authorized Compendium CE Trainer