

# Propagation Theory

## Course Syllabus Overview

### Duration – 8 days (Estimate)

#### 01. Concepts

- Waves
- Electromagnetic Waves
- Dipole Radiation
- Gain
- Free Space Propagation
- Harmonic Dipoles
- Link Equation
- Communications Systems
- Complex Propagation

#### 02. Electromagnetic Waves

- Maxwell's Equations
- Plane Waves
- Anisotropic Media
- Boundary Conditions
- Transmission through an Interface
- Oblique Incidence

#### 03. Reciprocity, Compensation, and Extinction

- Reciprocity Theorem
- Radio Systems
- Compensation Theorem
- Extinction Theorem

#### 04. Propagation Modifiers

- Multipath Interference
- Hills and Mountains
- Diffraction
- Ground Bounce
- Urban Propagation
- The Horizon
- Cross Polarisation
- Trees and other Vegetation
- Heavy Rain, Snow, or Fog

#### 05. Obstructions

- Friis Equation
- Surface Waves
- Channel Impulse Response

## 06. Propagation through Irregular Media

- Permittivity Anomalies
- Rytov Approximation
- Mutual Coherence
- Phase Screen Approximation
- Channel Simulation
- Rough Surfaces

## 07. Ionospheric Duct

- Benign Ionosphere
- Disturbed Ionosphere
- Vertical Propagation
- Oblique Propagation
- Propagation Losses
- Fading
- Noise

## 08. Propagation in the Lower Atmosphere

- Tropospheric Ducts
- Topography
- Surface Waves
- Water

## 09. Propagation through the Ionosphere

- Benign Ionosphere
- Faraday Rotation
- Doppler Shift
- Scintillation

## 10. Radio Systems

- Transmission Lines to Antenna
- Matched Load Power Transfer
- Standing Wave Ratio
- Reflection Coefficient
- Transmission Line Types
- Transmission Line Characteristics

## 11. Antennas

- Dipole
- Monopole
- Loop
- V-Beam
- Rhombic
- Vivaldi

- Yagi
- Slot
- Circularly Polarised
- Patch
- Arrays

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