



# iBwave CERTIFICATION COURSE SYLLABUS

## LEVEL 2: PROPAGATION, DATA COLLECTION AND OPTIMIZATION

Note: Course syllabus is subject to change

### PRE-COURSE FUNDAMENTALS

(to be completed through the Learning Center)

- ➔ Radio wave propagation basics
- ➔ Basic propagation models
- ➔ Antenna characteristics
- ➔ In-Building Propagation Models
- ➔ In-Building Propagation Guidelines

### FUNDAMENTALS: RADIO WAVE PROPAGATION BASICS

- ✓ Electromagnetic theory principles
- ✓ The uniform plane wave
- ✓ Effects of materials
- ✓ Propagation mechanisms
- ✓ Reflection and refraction
- ✓ Waveguiding
- ✓ Scattering

### FUNDAMENTALS: BASIC PROPAGATION MODELS

- ✓ Path loss
- ✓ Free space loss

### FUNDAMENTALS: ANTENNA CHARACTERISTICS

- ✓ Antenna basics
- ✓ Antenna parameters
- ✓ Radiation patterns
- ✓ Antenna types used for in-building
- ✓ In-building antenna cases
- ✓ Radiating cables

### FUNDAMENTALS: IN-BUILDING PROPAGATION MODELS

- ✓ In-building propagation models
- ✓ Empirical and physical models
- ✓ Comparing models: measures of accuracy
- ✓ Keenan & Motley empirical model
- ✓ Fast Ray Tracing & Cost 231 multi-wall empirical model
- ✓ In-building dominant path model
- ✓ Challenging environments

### FUNDAMENTALS: IN-BUILDING PROPAGATION MEASUREMENT GUIDELINES

- ✓ Propagation measurement basics
- ✓ Measurement equipment
- ✓ Walk routes guidelines
- ✓ Calibration and validation

### BUILDING MODELING

- ✓ Acquire knowledge on how to model a building
- ✓ Importing the walls from image files and AutoCAD, selecting the right building material, scaling and exporting it into a 3D model
- ✓ Hands-on workshop to practice building modeling using sample files from complex structures

### PROPAGATION FUNDAMENTALS

- ✓ Propagation module overview
- ✓ Prediction models overview

### RUNNING PREDICTIONS

- ✓ Configuring project prediction properties
- ✓ Configuring propagation model properties
- ✓ Setting up prediction areas and environment types
- ✓ Output maps available in iBwave Design
- ✓ Adding, configuring and running output maps
- ✓ Viewing prediction and compliancy results
- ✓ Comparing differences of propagation results using different propagation models and settings
- ✓ Propagation exercises using different compliancy areas and models
- ✓ Comparing accuracy of the model against measurement

### DATA COLLECTION

- ✓ Importing survey data from iBwave Mobile
- ✓ Importing survey data using alternative format
- ✓ Editing trace route and survey data
- ✓ Interpolating cellular survey signals
- ✓ Performing manual survey trace
- ✓ Associating survey data and output maps
- ✓ Survey data reports
- ✓ Workshop on importing survey data

### CALIBRATION AND VALIDATION

- ✓ Model calibration measurements
- ✓ Material (walls, floors) calibration
- ✓ Propagation model calibration and validation
- ✓ Workshop on model tuning and calibration

### IMPORTING OUTDOOR PREDICTION

- ✓ Define building properties
- ✓ Import outdoor prediction
- ✓ Viewing imported outdoor maps and legend
- ✓ Workshop on importing outdoor prediction

### OPTIMIZATION MODULE

- ✓ Analyzing signal quality using PIM calculations
- ✓ Optimization output maps (e.g., SNIR & Ec/Nt Maps)
- ✓ Optimization output maps reports
- ✓ Setting up optimization output map parameters

### DESIGNING A PROJECT FROM SCRATCH

- ✓ Designing a project from start to finish using Collection, Propagation and Optimization modules

### ADVANCED DESIGN VALIDATION

- ✓ Highlight common pitfalls when working on complex designs
- ✓ Use iBwave Design Enterprise to troubleshoot errors in a design
- ✓ Workshop on project validation

### PRACTICAL EXAM

(2.5 hours)

### PRODUCT PORTFOLIO OVERVIEW / CONCLUSION

(1 hour)