THE AFRICAN ADVANCED LEVEL TELECOMMUNICATIINS INSTITUTE (AFRALTI)

COURSE TITLE: **WiMAX SYSTEMS ENGINEERING**

Course duration: **5 days**

TARGET AUDIENCE:
This WiMAX course is targeted at WiMAX professionals who will be planning WiMAX deployments, and who therefore require the skills to design the network, balancing the requirements of service quality (including throughput and performance) with minimum capital and operations cost. The emphasis in the WiMAX RF Network Engineer Course is on the design of the WiMAX RF access network, including base station engineering and sitting, and propagation analysis to serve fixed and mobile subscriber stations.

OBJECTIVES:
To provide Engineers with Wimax technology, parameters, standards, applications and rollout frequency plans and strategies.

COUURSE CONTENTS:

Module 1: WiMAX Network Design Options
At the end of this module, delegates should be able to:
- List six applications of WiMAX technology
- Match each application to its WiMAX specification, frequency band, and architecture
- Describe five 802.16e mobile WiMAX enhancements

Module 2: Review of RF Fundamentals
At the end of this module, delegates should be able to:
- Calculate power levels in dBm, Watts and µV/m
- Apply Nyquist and Shannon observations to calculations of the bandwidth of channels, and to WiMAX's adaptive modulation and coding

Module 3: Antennas for WiMAX
At the end of this module, delegates should be able to:
- List three antenna diversity techniques
- Describe the operations of two types of MIMO systems and two types of Advanced Antenna Systems

Module 4: RF Design Considerations for WiMAX
At the end of this module, delegates should be able to:
- Describe the sources of noise based on bandwidth and operating frequency
- Determine the system noise floor based on bandwidth and Noise Figure
- Determine system performance based on C/N and Eb/No

Module 5: Performing a WiMAX Link Budget
At the end of this module, delegates should be able to:

- Determine LOS and NLOS Maximum Allowable Path Loss (MAPL) based on system parameters
- Determine power settings for a balanced path
- Use spreadsheets to design for specified lognormal fading probability
- Perform a link budget based on manufacturer's equipment parameters and system requirements

Module 6: WiMAX Path Loss Modeling
At the end of this module, delegates should be able to:

- Determine expected point-to-point link performance using an analytical path loss model
- Calculate expected NLOS performance using an empirical path loss model
- Determine the amount of margin required, based on lognormal fading

Module 7: Frequency Reuse in Fixed and Mobile WiMAX Networks
At the end of this module, delegates should be able to:

- Design the frequency reuse plan for your WiMAX network, working with your equipment vendor
- Diagram FUSC and PUSC permutation zones
- Discuss several reuse proposals for mobile WiMAX networks

Module 8: WiMAX Performance and Coverage Considerations
At the end of this lesson you should be able to:

- Explain and follow each step of the WiMAX Three-Phase Network Design process
- List eight WiMAX-specific network design considerations
- Model a flat-earth WiMAX network with the Design spreadsheet, and determine sensitivity of the estimated economic payback to changes in market and technical factors
- Determine site selection criteria
- Determine cell density required for a desired level of service, performance, and coverage
- Choose backhaul options to support throughput requirements

Module 9: WiMAX Coverage and Performance planning with modeling tools
At the end of this module, delegates should be able to:

- Employ a modeling tool to prepare an RF plan for your network in a three-part case study
- Illustrate the effect of frequency, power, terrain, clutter and CPE location on coverage
- Import terrain and clutter databases
- List options for accommodating system and subscriber growth

Module 10: Capacity Design, and Over-Subscription

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