WIRELESS COMMUNICATION TRAINING COURSES

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Wireless Communication

204 - Wireless O & M

Duration: 2 Day(s)

This course covers the basics of wireless operations support systems.

Objectives

Upon completion of this course, the participant will:

- Understand the concepts of wireless business, service and network management
- Understand BSS/OSS processes, technologies and systems
- Understand what different solutions that can be used to enable end-to-end automation and optimization of BSS/OSS processes in wireless networks and the benefits and limitations of each solution
- Understand wireless BSS and OSS processes
- Understand the impact of next generation wireless services and networks on BSS and OSS
- Understand technologies for creating and managing the next generation services and the networks
- Wireless applications and implementations

Prerequisites: Basic knowledge of wireless communications
For detailed information: *http://www.tonex.com/Courses/204/*

501: 802.11n Fundamentals - TONEX.com

Duration: 2 Day(s)

TONEX's 802.11n -- higher throughput improvements using MIMO (multiple input, multiple output antennas) -- course provides a comprehensive understanding of the 802.11n architecture and technology. 802.11n builds upon previous 802.11 standards by adding MIMO. Multiple transmitter and receiver antennas are used in MIMO to allow for increased data throughput through spatial multiplexing and increased range by exploiting the spatial diversity, perhaps through coding schemes like Alamouti coding. MIMO technology constitutes a breakthrough in the design of wireless communications systems, and is already at the core of several wireless standards including 802.11n. Exploiting multipath scattering, MIMO techniques deliver significant performance enhancements in terms of data transmission rate and interference reduction.

The course will cover major aspects of 802.11n with in depth information, example implementations, case studies and practical guidance to give your team members a running start.

Objectives

- Understand the basics of 802.11 Architecture
- Describe the key components in the 802.11n architecture
- Sketch the connectivity of 802.11n network components and their importance
- List basic 802.11n protocols
- Understand the basics of 802.11 protocols
- Understanding the basics of OFDM
- Understand the basics of MIMOs
- Understand the basics of 802.11n PHY
- Understand the basics of 802.11n MAC
- Identify the issues with 802.11n implementation
- Identify the importance of 802.11n functional and performance requirements and RF issues
- Discuss 802.11n deployment considerations
- Describe 802.11n QoS and security mechanisms
- Discover challenges with deploying 802.11n
- Identify 802.11n network monitoring and performance tuning

Prerequisites: Knowledge of 802.11 wireless LANs is recommended but not necessary.

For detailed information: *http://www.tonex.com/Courses/501/*

502: Intro to Wireless Technologies

Duration: 2 Day(s)

Introduction to Wireless Technologies is a comprehensive two-day course covering all the important aspects of the wireless networks, applications and services.

Objectives

Upon the completion of this course, the participants will:

- Have a comprehensive overview of wireless technologies, networks, services and applications
- Understand wireless fundamentals
- Understand fundamental radio communications concepts
- Understand mainstream wireless technologies and applications
- Understand cellular, TDMA/GSM, CDMA, GPRS, EDGE, CDMA2000 and the transition to 3G
- Form a solid knowledge base to build on

For detailed information: *http://www.tonex.com/Courses/502/*

503: Wireless LANs (802.11) Fundamentals

Duration: 2 Day(s)

This course provides an understanding of the wireless LAN technologies, applications and standards. Other important topics such as protocol layers, quality of service, throughput, coverage, interoperability, interference and security are discussed. Basic RF theory, propagation, link budget math, troubleshooting, WLAN security foundations and site survey are explored.

After a general introduction to wireless networks, this practical course moves quickly into the details of the wireless LANs standards (802.11a, 802.11b, 802.11g, 802.11n), 802.11 physical (DSSS and OFDM), MAC (Media Access Control), detailed 802.11 framing, WEP (Wired Equivalent Privacy protocol), WPA/WPA2, TKIP, 802.1x, Enhanced MAC (IEEE 802.11e), 802.11f, 802.11i, QoS Requirements, Inter-frame Spacing, EDCF Access, HCF for QBSS, Enhanced Security management operations, and the PCF (point coordination function) are all covered in detail. Real-world experiences through case studies and implementation tips are located throughout the course reference material.

Objectives

After successfully completing the course the students will:

- Understand the basic concepts of 802.11
- Be able to understand the technical implementation of different types of Wireless LANs
- Gain a general understanding of Wireless LANs systems coverage and capacity
- Be able to select the most effective wireless LAN type from a wide assortment of recent and emerging standards
- Examine an Independent assessment of competing wireless LAN technologies
- Be able to perform a more efficient design and operational

- support of wireless LANs because of an understanding of
- wireless LAN protocol operations and frame structures

Prerequisites: Basic understanding of wireless, radio communications and IP is recommended.

For detailed information: *http://www.tonex.com/Courses/503/*

504: Wireless LANs Security Fundamentals

Duration: 2 Day(s)

This TONEX two-day wireless LAN security course is cutting edge training in wireless LAN security technologies.

Objectives

The purpose of the course is to give you a full understanding of what wireless (802.11) networks are, how they work, how people find them and exploit them, and how they can be secured. This course is based on real world examples, solutions, and deployments. All material is developed and taught by individuals with extensive experience in wireless security research. Each student is supplied a CD-ROM with the latest tools, software, and documentation.

Wireless LAN Security Training include:

- Exploring 802.11a, 8011.b and 802.11g Network Architecture and Design
- Understanding 802.11 Security Threats
- Security Management, Wireless LAN Intrusion and Policy
- Overview of security software and protocols for wireless LANs
- Exploring of the security weaknesses of and threats to wireless LANs
- Overview of implementation of the best and latest security techniques and mechanisms
- Implementation of WEP, WPA, WPA2, 802.11i and 802.1x

Prerequisites: Attendees should be familiar with TCP/IP and basic networking.

For detailed information: *http://www.tonex.com/Courses/504/*

507: Radar Communications Training Fundamentals

Duration: 2 Day(s)

Radar Communications Training earns its price with its in-depth coverage of important, firm standards such as WML, WMLScript and XHTML. In addition a technical overview of WAP 2.0 is provided in this updated course. An overview of Open Mobile Architecture (OMA) initiative is also provided.

Objectives

Development of software for mobile telephones and other portable devices with Wireless Application Protocol (WAP), Wireless Markup Language (WML), WMLScript, XHTML, Active Server Pages (ASP), ColdFusion, Java, and other languages and technologies.

The Wireless Application Protocol (WAP), particularly its client-side markup language (WML), scripting language (WMLScript) and XHTML. All interface elements will be described, as well as WMLScript logic, events, and communications capabilities. Server-side coverage goes to Perl, Java servlet programming, and the Nokia WAP Server. This course covers many topics including:

- WAP Standards
- New Global Organization, the Open Mobile Alliance (OMA)
- Introduction to the Wireless Application Protocol (WAP)
- Survey of markup languages (SGML, XML, and XHTML)
- Basic XML overview, including schemas and well-formed vs. valid XML
- Document Type Definitions (DTDs)
- Wireless Markup Language (WML) overview
- Decks and cards
- Compiling WML
- Formatting text
- Hyperlinks, and navigating between cards (anchors and events)
- WML images, tables, and variables
- User input with input boxes and option lists
- WMLScript tutorial (functions, variables, and control structures)
- Sample WMLScript applications
- Error handling
- Math and script manipulation in WMLScript
- User and timer events
- Openwave.com/Phone.com WML extensions
- Usability guidelines for wireless applications
- WML incompatibilities on different WAP devices
- Introduction to Active Server Pages (ASPs) and ActiveX Data Objects (ADOs) used with WAP, XML, and XSLT
- Installing the Nokia, Ericsson, Microsoft, and Motorola WAP SDKs/tools
- WML and WMLScript reference
- Why WAP 2.0
- Objectives of WAP 2.0
- Major Architectural Component of WAP 2.0
- WAP and XML
- XHTML Mobile Profile (XHTMLMP) Overview
- Open Mobile Alliance
- Open Mobile Architecture initiative and the WAP Forum
- Location Interoperability Forum (LIF)
- SyncML
- MMS Interoperability Group (MMS-IOP)
- Wireless Village

Upon completion of this course, you should be able to:

- Analyze the requirements for a WAP/WML-based application
- Analyze WML Formatting, WML Links, WML Input
- Create a basic WML application
- Write WML code that processes user tasks
- Create WML Tasks, WML Timer, WML Variables
- Write WML code that creates, displays, and removes variable values
- Write WML code that accepts user input
- Write WML code that creates tables, adds graphics, and formats graphics
- Write WML code that uses timers and multiple character sets
- Explain how to deploy WML applications on a Web server
- Understand and analyze the requirements for a WAP 2.0-based application/XHTML
- List issues that affect performance or server-side development

For detailed information: *http://www.tonex.com/Courses/507/*

509: TETRA Fundamentals

Duration: 2 Day(s)

This course introduces students to a TETRA. Terrestrial Trunked Radio (TETRA) is an open digital standard defined by the European Telecommunications Standards Institute (ETSI) specifically for the needs of the most demanding professional mobile radio users, especially those dealing with emergencies and disasters.

Prerequisites: None

For detailed information: *http://www.tonex.com/Courses/509/*

510: LMDS/MMDS Fundamentals

Duration: 2 Day(s)

Local Multipoint Distribution Services (LMDS) is a fixed broadband wireless access system using a range of frequencies around 28-31 GHz. This service allows for two-way digital communication for voice, video, and high speed data communication.

LMDS systems are relatively simple and quick to install once the initial planning and layout is complete. It provides an extremely fast and cost effective means to setup new communication links for customers. This also alleviates the problems associated with obtaining rights-of-way and high expenses associated with laying fiber or cables course covers all the details of LMDS and MMDS.

For detailed information: *http://www.tonex.com/Courses/510/*

513: Microwave Training Fundamentals

Duration: 2 Day(s)

Microwave networks provide reliable point-to-point and highly directional communication that maximizes your RF transmission. Because Microwave uses a higher frequency band, the capacity, throughput, and reliability of Microwave networks is well proven and understood to be very efficient throughout the telecommunications industry. In existence since the mid 1940's, point-to-point microwave now uses digital modulation rather than simply analog.

This course presents the state-of-the-art in microwave communications. The course presents the basic theory, procedures, and techniques for microwave systems. Detailed mathematical analyses are minimized in order to concentrate on basic concepts, procedures, and optimal applications. Measured results are used to demonstrate each of the techniques discussed.

Objectives

After completing this course, students will be able to:

- Explain the Basics of RF and Microwave
- Understand the engineering tools and procedures required for Microwave engineering and planning
- Understand existing and emerging standards for Microwave
- Understand RF Propagation and Antenna Principle
- Describe and understand a broad spectrum of antenna types
- Discuss Microwave Modulation Techniques
- Review Microwave System Design Considerations
- Review Microwave System Budget Profiles
- Calculate Microwave Propagation Losses and Link Budgets
- Explain Microwave performance and Optimization considerations
- Analyze system degradation due to Microwave components
- Evaluate the performance of differing Microwave wireless system architectures
- Explore project planning process of Microwave Systems
- Review successful Microwave Deployments
- Step through a practical process for managing Microwave networks
- Explore the current and future market trends

Prerequisites: A basic understanding of telecommunications transmission principles will be useful for students taking this course.

For detailed information: *http://www.tonex.com/Courses/513/*

594: Software-Defined Radio (SDR) Training

Duration: 2 Day(s)

A software-defined radio (SDR) system is a radio communication system which uses software for the modulation and demodulation of radio signals. The goal of SDR is to produce a radio that can receive and transmit a new form of radio protocol just by running new software.

The hardware of a software-defined radio typically consists of a superheterodyne RF front end which converts RF signals from and to analog IF signals, and analog to digital converter and digital to analog converters which are used to convert a digitized IF signal from and to analog form, respectively.

SDR technologies provide software control of a variety of modulation, interference management and capacity enhancement techniques over a broad frequency spectrum (wide and narrow band), while ensuring secure communications management. Radios built using SDR concepts offer:

- Standard architecture for a wide range of communications products
- Non-restrictive wireless roaming for consumers by extending the capabilities of current and emerging commercial air-interface standards
- Uniform communication across commercial, civil, federal and military organizations
- Flexibility and adaptability
- Potential for significant life-cycle cost reductions
- Over the air downloads of new features and services as well as software patches
- Advanced networking capabilities to allow truly "portable" networks
- Worldwide interest and investment in the SDR technologies is growing significantly, with key standardization and development efforts now taking place throughout Europe, North America, Japan, Korea, and China.
- In addition to the broad benefits listed above, SDR technologies offer unique benefits to players on every tier of the value chain

Objectives

After successfully completing the course the student will:

- Understand the purpose of implementing of SDR
- Understand how the network can support the implementation of new services, the impact that these services will have on the network including the security, charging, and quality of service considerations.

Prerequisites: Basic RF

For detailed information: *http://www.tonex.com/Courses/594/*

RF Technologies

511: RF Training Fundamentals

Duration: 2 Day(s)

RF Training course covers the basics of RF theory such as propagation modeling, link budget, modulation, channel coding, antennas, capacity planning, propagation, frequency planning and optimization. EARN 13 PDH TO BE APPROVED BY PIE.

Objectives

After completing this course, students will be able to:

- Explain the Basics of RF
- Understand the engineering tools and procedures required for RF engineering and planning
- Understand existing and emerging standards for RF
- Understand RF Propagation and Antenna Principle
- Describe and understand a broad spectrum of antenna types
- Discuss RF Modulation Techniques
- Review RF System Design Considerations
- Review RF System Budget Profiles
- Calculate propagation losses and link budgets.
- Explain RF performance and Optimization considerations
- Analyze system degradation due to RF components
- Evaluate the performance of different RF wireless systems
- Explore project planning process of RF
- Discuss successful and unsuccessful RF deployments
- Step through a practical process for managing RF networks
- Explore the current and future RF market trends

Prerequisites: None

For detailed information: *http://www.tonex.com/Courses/511/*

515: Cellular Networks Performance Workshop Training

Duration: 3 Day(s)

This course provides a complete overview of the QoS and performance on the entire GSM/GERAN, CDMA and UMTS systems. It provides an introduction to the performance and QoS complete evolution of GSM towards a radio access anc core IP networks that efficiently supports UMTS services (GERAN).

It features a comprehensive study of system performance with simulations and field trials. Covers all the major features such as basic QoS of voice, data and multimedia applications in GSM, GPRS, EDGE, CDMA, W-CDMA/UMTS and AMR and the full capability of the GERAN radio interface for 3G service support is envisaged.

We will discusse different 3G technologies and the position of GERAN, CDMA, and W-CDMA/UMTS within such technologies.

Objectives

After completing this course, the student will be able to:

- Describe the basic GSM, GPRS, EDGE, CDMA and W-CDMA/UMTS architecture
- Overview of operations and the configurable QoS/Performance parameters
- Overview of the major performance enhancing features
- Understand the key network performance KPIs
- Describe how control channels and traffic channels should be dimensioned to ensure QoS and service availability/ reliability
- Analyze the QoS and performance features, counters and parameters of your network equipment

For detailed information: *http://www.tonex.com/Courses/515/*

517: RF Optimization

Duration: 4 Day(s)

This course provides a thorough overview of the principles behind RF optimization. This four-day course builds competence in the principles and present-day practices used to improve the operating performance of modern wireless systems. Core performance indicators are thoroughly explored and desirable healthy operating conditions are identified. Both system-side and mobile-side performance-monitoring tools are introduced. The main operating parameters are identified along with the considerations necessary to properly set them in real systems.

Signatures of specific problems (including several deadly but innocent-appearing failure mechanisms) are identified, along with their common solutions. Real-life captured drive-test examples are studied and solved by the class. Special attention is given to multiple-carrier and intersystem handoff issues, system determination algorithms commonly used by mobiles, and data communication, and a glimpse of future issues.

At conclusion, participants will be able to evaluate their own systems' performance, armed with the knowledge and confidence necessary to identify and solve most common problems.

APPLICABILITY

Wireless LANs, Wireless WANs, Microwave Systems, WiMAX (802.16-2004), Mobile WiMAX (802.16e-2005), Satellite,CDMA, CDMA2000, GSM, GPRS, EDGE, and W-CDMA UMTS systems (R99, HSDPA, HSUPA)

Objectives

Upon completing the course, the participant will be able to:

- Understand RF optimization principles and procedures
- Understand the basic RF operations and the configurable parameters that control them
- Select key network performance counters
- Examine RF optimization KPIs (Key Performance Indicators)
- Describe RF measurements and testing types
- Explain why the various measurements must be made
- Perform uncertainty analysis on the measurements and determine how to improve accuracy
- Review Performance-monitoring tools available from the System and the mobile side
- Review Performance-monitoring tool
- Explore Real-Life Drive-Text Example Cases to be solved in class
- Discuss Real-World Optimization Issues and Solutions

Prerequisites: One to two years exposure to communications systems or general electronics.

For detailed information: *http://www.tonex.com/Courses/517/*

5020: Advanced RF

Duration: 4 Day(s)

This Tonex Advanced RF course provides a multidimensional overview for professionals involved in the specification, procurement, design, testing, operations and optimization of next-generation wireless and communications systems.

Objectives

- Learn critical details of major RF systems analysis and design advances
- Learn the structure of RF systems and associated issues
- Learn about critical RF design and engineering procedures and principals
- Learn how to work with specifications, procurement, design and development, testing, and operation of current and future RF systems
- Assess RF system design/operations
- Assess effects of RF system advances on communications technique effectiveness
- Examine and evaluate RF systems performance and optimization processes
- Analyze RF system components
- Step through a practical process for analyzing, optimizing and managing advanced RF networks

5021: RF Safety Training

Duration: 2 Day(s)

Radiofrequency (RF) and microwave (MW) radiation are electromagnetic radiation in the frequency ranges 3 kilohertz (kHz) - 300 Megahertz (MHz), and 300 MHz - 300 gigahertz (GHz), respectively.

Electric and magnetic fields are complex physical agents whose potential health effects are the subject of much research. Particularly controversial are the biophysical mechanisms by which these RF fields may affect biological systems. General health effects reviews explore possible carcinogenic, reproductive and neurological effects. Health effects by exposure source are noted in radar traffic devices, wireless communications with cellular phones, radio transmission, and magnetic resonance imaging (MRI).

RF exposures are directly linked to absorption and distribution of RF energy in the body, and the absorption and distribution are strongly dependent on body size and orientation and on frequency and polarization of the incident radiation. A common measure of exposure is the Specific Absorption Rate (SAR), the rate of energy absorption in tissue, measured in watts per kilogram of tissue.

The FCC requires that all wireless and RF generating sites be fully compliant with its RF/NEPA rules! Environmental rules for evaluating the potential for human exposure to RF are complex. Assessing the cumulative RF levels at multiple emitter collocation sites creates an even greater challenge. Then, there is OSHA!
RF Safety Training covers the theory and practical aspects of identification and prevention of all possible biological effects of exposure to RF/MW radiation from radios, cellular phones, communications transmitters, radar transmitters and more.

In our increasingly complex RF world of cell towers, rooftop antennas, in-building antennas and other sources of RF energy, RF Safety Training is essential to any professional who might be engaged in activities near antennas and wireless equipments. This course can be customized or combined to meet specific system requirements.

Anyone attending this course will be issued a completion certificate and card complying with OSHA reporting requirements in 29 CFR1910.268.

Objectives

Upon completion of this course, the attendees will:

- Understand safety and health programs
- List Radiofrequency and microwave safety programs
- Identify regulations and RF standards
- Understand RF Exposure Guidelines and RF Compliance Guidelines
- Understand FCC and OSHA regulations
- Understand radiation and field effect
- Understand RF site safety
- Perform hazard assessment
- Understand Maximum Permissible Exposure (MPE) at RF sites
- Perform Lock-out Tag out procedures and personal protective equipment
- Explore protective equipment Use including personal protective equipment for eyes, face, head

CDMA & 1xEv-DO

514: Binary Runtime Environment for Wireless (BREW) Fundamentals

Duration: 2 Day(s)

TDMA (also known as D-AMPS) is a technology for digital transmission of radio signals between, for example, a mobile telephone and a radio base station. In TDMA, the frequency band is split into a number of channels, which are stacked into short time units, so that several calls can share a single channel without interfering with one another. TDMA is used by the GSM digital mobile standard.

TDMA is based on the IS-136 standard. It is one of the world's most widely deployed digital wireless systems. It provides a natural evolutionary path for analog AMPS networks, offers efficient coverage and is well suited to emerging applications, such as wireless virtual private networks (VPNs), and is the ideal platform for PCS (Personal Communication Services).

Objectives

This course provides you with a comprehensive business and technical foundation in TDMA networks, services and applications development.

Prerequisites: None

For detailed information: *http://www.tonex.com/Courses/514/*

581 - CDMA Fundamentals (IS-95)

Duration: 2 Day(s)

This course provides a technical and business overview of current and coming CDMA technologies, starting with a review of CDMA fundamentals and the 2G IS-95 standard. It then offers detailed explanations of the prominent 3G wideband CDMA implementations, including TIA cdma2000 and ETSI/ARIB W-CDMA, so that you and your organization can be ready to meet the coming challenges. Since the new 3G-CDMA standards are constantly evolving, this course prepares the technical professional to understand and interpret virtually any CDMA standard that is defined or that may emerge.

The following topics are covered:

- Spread Spectrum Techniques and Architectures
- CDMA Will Be the Dominant Mobile Telephone Technology
- Why CDMA Has Grown Rapidly
- Why CDMA is Preferred Technology for Next Generation Systems
- CDMA: Key Enabler for the Wireless Internet
- Overview of CDMA call processing and signaling
- Overview of CDMA2000 and 1xEV-DO

Prerequisites: This is an introductory course with no prerequisites.

For detailed information: *http://www.tonex.com/Courses/581/*

582: CDMA2000 Fundamentals

Duration: 2 Day(s)

This course provides the student an in-depth description of the functioning of a cdma2000 system according to the key CDMA standards (TIA/EIA/IS2000-A) and the rationale behind the specifications. Course discussions provide a point by point description of key processes including power control, spread spectrum signal generation, hand-off techniques, call processing, registration, authentication, encryption. Emphasis is placed on new features and capabilities introduced in cdma2000.

Objectives

Upon completing this course the participant will be able to define CDMA2000 in a 3G context, understand how CDMA2000 (1x, 1xEV-DO and 1xEV-DV) enhances IS-95 networks, list its new services, explain its key aspects and capabilities as an access network, find information in appropriate documents, and suggest its likely evolution into the 3G world.

The detailed descriptions of the radio interface as an elaborate extension of the IS-95 Access Network, the MAC, LAC, and RLP sub-layers, and the behavior of the system offered in the course should allow the participant to, for example, understand dimensioning procedures and predict the consequences of various configurations.

Prerequisites: An understanding of data Communications of TCP/IP and IP routing is preferred.

For detailed information: *http://www.tonex.com/Courses/582/*

583 - 1xEV-DO Fundamentals

Duration: 2 Day(s)

1xEV-DO or 1x Evolution for Data Optimized (Rev 0, Rev A, Rev B and Rev C; Ultra Mobile Broadband (UMB)), a data-optimized version of CDMA2000 called 1xEV-DO, provides a flexible, integrated solution that maximizes capacity and throughput for both voice and data. This course presents a clear explanation of 1x-EV-DO including: it's advantages, standards, architecture, protocols, operations, technical capabilities, security and implementation.

Objectives

After completing this course, students will be able to:

- Explore Spread spectrum signal generation and spreading requirements
- Understand CDMA2000-1x-EV-DO (Rev 0, Rev A, Rev B and Rev C)
- 1xEV-DO (Rev C), UMTS-LTE (HSOPA) and Mobile WiMAX
- Discuss 1xEV-DO Call processing
- Understand Codes and Modulation Schemes used in 1xEV-DO
- Understand Physical List Packet Formats
- Understand Forward Link Structure
- Understand Reverse Link Structure
- Discuss Data Rates and Modulation Parameters
- Discuss fundamentals of TCP/IP
- AAA-RADIUS, Routers, Bridges, NAT, Security and IPsec
- Review CDMA2000 packet network architecture
- Discuss call processing in 1xEV-DO
- Review 1xEV-DO end-to-end scenarios
- Explore project planning process of 1xEV-DO Networks
- Review successful 1xEV-DO Deployments
- Step through a practical process for managing 1xEV-DO networks
- Explore the current and future market trends
- Overview of features of both Rev 0 and Rev A and differences between the two releases

Prerequisites: The CDMA Standard: IS-95A/B, IS-2000 or equivalent knowledge.

For detailed information: *http://www.tonex.com/Courses/583/*

585: CDMA Network Planning

Duration: 2 Day(s)

This two-day course presents the network planning principles applicable to modern wireless RF systems and a thorough yet easy-to-follow introduction to CDMA and CDMA2000 network planning with its unique RF considerations. The course is an effective pathway for engineers and technical personnel from other backgrounds or technologies who want to come up to speed quickly in CDMA network planning and RF engineering.

This two day course is for anyone involved in the network deployment process that needs to learn about network planning principles as applied to CDMA networks.

At conclusion, participants should be familiar with the key principles of signal physics and interference principles, RF propagation in the wireless environment, antennas for wireless systems, traffic engineering and wireless capacity considerations, as well as the key operational and design issues of CDMA systems.

Network planning course will give the technical professional the required knowledge and background to perform RF network planning activities for a CDMA network. The course is intended for those individuals familiar with the CDMA Air Interface Standard, either IS-95 or cdma2000, but desiring to understand the basic concepts behind planning a CDMA and CDMA2000 1x network.

Objectives

After successful completion of this course, attendees will have a good technical understanding of:

- CDMA and CDMA2000 Network Planning Principles
- Link Budgets
- Propagation Models
- Traffic Modeling
- CDMA Traffic Engineering
- Network considerations
- Initial Planning
- Tools Overview
- PN Planning
- Input Parameters
- Spectrum Planning
- Handoff Planning
- Site Selection Criteria
- Summary and Conclusion

For detailed information: *http://www.tonex.com/Courses/585/*

591: CDMA2000 (1xEV-DO) Security

Duration: 2 Day(s)

Having completed this course the participant will be able to understand how security is implemented, deployed and managed in IS-95 and CDMA2000 (1x-EV-DO and 1xEV-DV) networks, understand security concepts, understand the benefits of new security techniques applied and how they are implemented.

Objectives

The goal of this course is to give the participant a strong and intuitive understanding of what security in the wireless systems is and how the security functions are implemented in the CDMA radio and core network. The course focuses both on the air interface and the core network.

- The detailed descriptions of the security in the context of IS-95 and CDMA2000 (1x-EV-DO and 1xEV-DV) platforms
- A detailed description of security architecture
- Principles behind security
- Detailed descriptions and comparison of the cryptographic solutions in GSM/GPRS/UMTS and CDMA family
- Weaknesses in IS-95, 1x-EV-DO and 1xEV-DV security mechanisms
- New security features

Prerequisites: General knowledge of IS-95 and CDMA2000 networks.

For detailed information: *http://www.tonex.com/Courses/591/*

GSM & GPRS/EDGE

506: Short Message Service (SMS) Fundamentals

Duration: 3 Day(s)

This 2-day course explores SMS in North American and EMEA networks. It provides a good understanding of the Short Message Service, including the protocols, service aspects, architecture, products and applications.

Prerequisites: Basic knowledge of mobile networks (3GSM, CDMA)

For detailed information: *http://www.tonex.com/Courses/506/*

542: GSM Fundamentals

Duration: 2 Day(s)

This practical course provides an extremely comprehensive, up-to-date, and easy-to-understand treatment of the entire GSM network and the signaling methods of its terrestrial interfaces. In this course, you will gain the knowledge necessary to understand and use GSM services, network, architecture, protocols, terminology, implementation and all the interfaces in between the GSM subsystems.

It provides you with a comprehensive business and technical foundation in GSM network, services and applications. This course will familiarize you with all essential GSM nodes, their functionality as well as their interaction with each other and with nodes outside GSM network.

Objectives

- Understand the functionality of a GSM network
- Explain the basics of GSM network planning
- Explore project planning process of GSM/GPRS networks
- Understand the engineering tools and procedures required for GSM engineering and planning
- Understand existing and emerging standards for GSM, GPRS, EDGE and UMTS
- Review successful GSM deployments
- Discuss successful and unsuccessful GSM/GPRS deployments
- Step through a practical process for managing a GSM/GPRS project
- Explore advanced features in GSM and GPRS networks
- Explain GSM architecture and services
- Describe functions of BTS, BSC and TRAU
- Describe functions of VLR, HLR,EIR, MSC, G-MSC
- Describe SS7 network architecture and functions
- Explore IMSI Attach/Detach and Location Update GSM procedures
- Understand GSM protocols and layers
- Explore GSM/GPRS operation procedures
- Explore GSM radio and core network signaling
- Explore GSM/GPRS customer care and support
- Explore GSM/GPRS troubleshooting
- Explain the basics of GSM security

Prerequisites: None

For detailed information: *http://www.tonex.com/Courses/542/*

544: GSM System Engineering

Duration: 2 Day(s)

This two-day seminar provides a solid grounding in principles of basic GSM system design and RF engineering. Propagation, antenna systems, and traffic engineering principles are thoroughly introduced. Finally, GSM system design, growth, and performance considerations are explored each student receiving example files on disk

Prerequisites: Basic technical mathematics

For detailed information: *http://www.tonex.com/Courses/544/*

545: GSM , GPRS and UMTS Security

Duration: 2 Day(s)

Having completed this course the participant will be able to understand how security is implemented, deployed and managed in GSM, GPRS and UMTS networks, understand security concepts, understand the benefits of new security techniques applied and how they are implemented.

Objectives

The goal of this course is to give the participant a strong and intuitive understanding of what security in the wireless systems is and how the security functions are implemented in the GSM/GPRS/UMTS radio and core network. The course focuses both on the air interface and the core network.

Prerequisites: General knowledge of GSM/GPRS Networks.

For detailed information: *http://www.tonex.com/Courses/545/*

546: Customized Applications for Mobile Network enhanced Logic (CAMEL) Fundamentals

Duration: 2 Day(s)

This practical course provides an extremely comprehensive, up-to-date, and easy-to-understand treatment of CAMEL (Customized Applications for Mobile network Enhanced Logic).

Objectives

After completing this course, students will be able to:

- Understand the basics of SS7 (Architecture and protocols, MTP, SCCP, TCAP, MAP and CAP)
- Understand the basics behind GSM, GPRS and IMS Procedures
- Understand the basics behind SMS and USSD
- Learn the basic GSM, GPRS and UMTS Service Architecture
- Understand the basics of IN Services Applied to Mobile
- Understand and Basic Concepts behind IN Service Creation
- Explain Basic IN and AIN
- Explain Basic CAMEL Architecture
- Learn how CAMEL applies to GSM, GPRS, and IMS

Prerequisites: None.

For detailed information: *http://www.tonex.com/Courses/546*

561: GPRS Fundamentals

Duration: 2 Day(s)

This course provides you with a comprehensive business and technical foundation in GPRS network, services and applications development.

This course provides the attendees with an understanding of the GPRS architecture, protocols, air interface and functions involved in signaling and data transfer. Attendees will gain an understanding of GPRS services, functionality of a GPRS network, e.g. the functions of GGSN and SGSN, the procedures of GPRS Attach, PDP-context activation, Border Gateway (BG), and GPRS QoS.

Objectives

After completing this course, students will be able to:

- Understand the functionality of a GPRS network
- Understand GSM system evolution to GPRS
- Explain the basics of GPRS network planning
- Explore project planning process of GPRS networks
- Understand the engineering tools and procedures required for GPRS engineering and planning
- Understand existing and emerging standards for GSM, GPRS, EDGE and UMTS
- Review successful GPRS deployments
- Discuss successful and unsuccessful GSM/GPRS deployments
- Step through a practical process for managing a GSM/GPRS project
- Explore advanced features in GSM and GPRS networks
- Explain GPRS architecture and services
- Understand GPRS protocols and their functions
- Describe functions of SGSN, GGSN, BG, and CG
- Describe IP network architecture and functions
- Discuss obstacles of Packet-Switched Mobile Networks
- Review GPRS Network Architecture and Protocols
- Discuss GPRS architecture and services
- Understand the functionality of a GPRS network
- Explore GPRS Attach/Detach and PDP Context Activation/Deactivation procedures
- Explain the basics of GPRS security
- Explore GPRS troubleshooting
- Understand the GPRS flows and traffic cases in data transfer and signaling
- Explore EDGE and E-GPRS

Prerequisites: Knowledge in GSM is required

For detailed information: *http://www.tonex.com/Courses/561/*

562: EDGE Fundamentals

Cost: $1999 | Duration: 3 Day(s)

This course introduces the technical fundamentals of Enhanced Data Rates for Global Evolution (EDGE).

Prerequisites: Knowledge of GSM and GPRS

For detailed information: *http://www.tonex.com/Courses/562/*

UMTS (W-CDMA)

519: IP Multimedia Subsystem (IMS) Training

Duration: 3 Day(s)

The IP Multi-Media Subsystem (IMS) is an IP multimedia and telephony core network. It is defined by 3GPP and 3GPP2 standards and organizations based on IETF Internet protocols. IMS is access independent as it supports IP to IP session over wireline IP, 802.11, 802.15, WiMAX, CDMA, GSM/EDGE/UMTS and other packet data applications.

IMS permits and enhances real time, multimedia mobile services such as rich voice, video telephony, messaging, conferencing and push services by responding to the emerging trend to move toward a common, standardized subsystem. As data services proliferate and the value chain expands, current vertical application platforms are proving insufficient to meet operator needs. IMS represents a standardized, reusable platform providing a better way to experiment with, deploy, integrate, and expand consumer and enterprise voice and data services.

This course provides an advanced technical overview of IMS.

In this course we will discuss various advanced concepts that are integral to the development of IMS and all IP networks.

Objectives

After completing this course, students will be able to:

- Understand concepts behind All-IP Multimedia Networks
- Understand IMS architecture
- Explain IMS reference architecture
- Understand IMS session control, connection control and applications services
- Explore SIP and SDP extensions used in IMS
- Explain IMS services
- Understand IMS Security and QoS

Prerequisites: None

For detailed information: *http://www.tonex.com/Courses/519/*

520: Advanced HSDPA

Duration: 3 Day(s)

High Speed Downlink Packet Access (HSDPA) is a packet-based data service in W-CDMA downlink with data transmission up to 8-10 Mbps (and 20 Mbps for MIMO systems) over a 5MHz bandwidth in WCDMA downlink. HSDPA implementations includes Adaptive Modulation and Coding (AMC), Multiple-Input Multiple-Output (MIMO), Hybrid Automatic Request (HARQ), fast cell search, and advanced receiver design.

Objectives

Advanced HSDPA training course provides you with a comprehensive technical foundation in HSDPA analysis, design, implementation and testing (RF and MAC layers applied to mobile device, Node B (BS) and RNC)

Prerequisites: Knowledge of UMTS and W-CDMA is needed.

For detailed information: *http://www.tonex.com/Courses/520/*

572: UMTS Fundamentals

Duration: 2 Day(s)

This course provides a technical overview of UMTS/WCDMA technology and its evolution.

Objectives

After successfully completing the course the attendees will:

- Understand the evolution from GSM to UMTS
- Understand the basics of UMTS radio communication
- Examine UMTS Radio Access Network (UTRAN)
- 3GPP release 99, 4, 5 , 6, 7 and 8
- Understand the UMTS Core Network
- Examine the services in the UMTS core network environment
- Understand UMTS Protocols
- Understand Services in the UMTS Environment
- Understand Security in the UMTS Environment
- Explain the overall system design and describes the network elements and functions of a complete UMTS network.
- Examine the radio access and core network in further detail explaining the functions and services provided to the end users.
- Explain how different functions are distributed throughout the network by means of communication protocols providing references to the original UMTS standards published by the 3rd Generation Partnership Programs (3GPP and 3GPP2)

Prerequisites: Basic GSM and GPRS knowledge is preferred.

For detailed information: *http://www.tonex.com/Courses/572/*

573: UMTS Core Network Fundamentals

Duration: 2 Day(s)

The course covers the details of various functions of the Core Network including Mobility Management, authentication, security, roaming, call and session setup and evolution of the UMTS network towards an all-IP based network. It gives an overview of the evolved core networks in different releases of UMTS from Release 4 to Release 8.The Core Network has several interfaces, which need to be configured and dimensioned. The Core Network hardware configuration is also vendor specific. Network vendors have very extensive documentation how to design all aspects of core network starting from the room environmental requirements up to the post integration system quality audit.

Planning the UMTS core network consist of GSN (GPRS Service Node) system design, MSC and registers dimensioning, OMC dimensioning, Core network interface dimensioning, HSS and IMS components.

Objectives

After successfully completing the course the student will:

- Understand the purpose of implementing packet switching in the existing GSM system
- Know how the UMTS architecture looks like
- Know what the core network looks like in UMTS as well as the architecture.
- Understand the evolution of the Core Network from GSM/GPRS over UMTS R99 and R4 towards the "All-IP" of R5, R6, R7 and R8
- Understand the UMTS network infrastructure and components

- Learn the requirements and operation of a UMTS Core Network, and the fundamentals of the "3G All IP" network
- Understand CAMEL, MEXE and their role within the Virtual Home Environment
- Understand in depth ATM (Asynchronous Transfer Mode), AAL structures, and VoIP. and their role within older UMTS releases
- Learn the new 3G signaling protocols, transport, control and user planes etc.
- Understand 3G-MAP, UDP/IP and TCP/IP and their roles within 3G
- Understand how Call transactions are constructed and executed
- Understand end-to-end service establishment flows in the Release 5, Release 6, Release 7 and R8 architectures
- Understand IP Multimedia Subsystem (IMS)
- Understand Voice Call Continuity (VCC) in the IMS
- Understand the enabling technologies such as SIP, MEGACO and IPv6 and the use of these technologies within All-IP Multimedia architecture
- Understand how the network can support the implementation of new services, the impact that these services will have on the network including the security, charging, and quality of service considerations.
- Become familiar with the network evolution towards 4G/LTE

Prerequisites: GSM/UMTS Core Network and packet switching technologies are preferred.

For detailed information: *http://www.tonex.com/Courses/573/*

575: HSPA/HSPA+ Network Planning and Design Training - Level I

Duration: 3 Day(s)

HSPA/HSPA+ Network Planning and Design Training course covers the network planning of UMTS/HSPA/HSPA+ network covering the CS, PS and IMS domains. This course is vendor-neutral, thus maximizing the true value of this telecom educational experience for its attendees.

Objectives

This course provides you with a comprehensive business and technical foundation in UMTS/HSPA/HSPA+ network, migration paths, services and applications development.

Prerequisites: Good knowledge of GSM/GPRS, ideally previous 2G RF/Transmission Planning exp., Some Knowledge of RF software propagation tools, some previous background knowledge of UMTS. Any previous radio air-interface/BSS knowledge would also be advantageous

For detailed information: *http://www.tonex.com/Courses/575/*

576: HSDPA Fundamentals

Duration: 2 Day(s)

High Speed Downlink Packet Access (HSDPA) is a packet-based data service in W-CDMA downlink with data transmission up to 8-10 Mbps (and 20 Mbps for MIMO systems) over a 5MHz bandwidth in WCDMA downlink. HSDPA implementations includes Adaptive Modulation and Coding (AMC), Multiple-Input Multiple-Output (MIMO), Hybrid Automatic Request (HARQ), fast cell search, and advanced receiver design.

HSDPA is based on W-CDMA evolution and is standardized as an element of the 3GPP Release 5 WCDMA specification, and is in fact the key new feature in this latest release. It is a backward-compatible extension of the basic UMTS Rel'99 specifications that supports voice, mixed voice/data and real-time services, all on a single carrier. It is designed to provide impressive benefits over the basic UMTS standard:

- Up to three times the spectral efficiency
- Triple the data throughput, on average
- 8 Mbps improvement in peak data rates (10 vs. 2 Mbps)
- Fewer end-to-end delays

Objectives

This course provides you with a comprehensive business and technical foundation in HSDPA migration paths, services and applications development. It offers an overview of the High Speed Downlink Packet Access (HSDPA) technology. HSDPA enhances the packet data services provided in W-CDMA (UMTS) by increasing the data throughput and reducing unwanted delays and it allows carriers to increase downlink throughput over W-CDMA links

578: UMTS/HSPA/HSPA+ and LTE Security Training

Duration: 2 Day(s)

Having completed this course the participant will be able to understand how security is implemented, deployed and managed in UMTS/HSPA/HSPA+ and LET networks, understand security concepts, understand the benefits of new security techniques applied and how they are implemented.

Objectives

The goal of this course is to give the participant a strong and intuitive understanding of what security in the wireless systems is and how the security functions are implemented in UMTS/HSPA/HSPA+ radio and core network. The course focuses both on the security on the air interface and the core network.

Prerequisites: Knowledge of UMTS services and network architecture prior to attending the course is an advantage

For detailed information: *http://www.tonex.com/Courses/578*

579: UMTS QoS Fundamentals

Duration: 2 Day(s)

The course examines how the UMTS network supports end-to-end Quality of Service. The different functions and protocols supporting end-to-end QoS are described, with focus on the UMTS Bearer Service and the solutions in the packet switched domain.

Objectives

Upon completion of this training, the participants will be able to successfully describe the UMTS QoS elements and having used them, know what to expect when the QoS features are employed in UMTS networks.

Upon completion of this course, the participant will:

- Understand what Quality of Service to expect from the UMTS network and what requirements this put on the different nodes in the UMTS architecture.
- Understand what different solutions that can be used to enable QoS in a packet switched network, and the benefits and limitations of each solution.
- Understand how end-to-end Quality of Service could be implemented using IP and ATM mechanisms.

- The implementation of QoS on each interface in the UMTS architecture is discussed, from the radio interface and ATM network to the IP solutions in the backbone and the External Bearer Service.
- The QoS solution of the IP Multimedia Subsystem (IMS) is described

592: HSUPA Fundamentals

Duration: 2 Day(s)

HSUPA (High Speed Uplink Packet Access) is a packet-based data service in W-CDMA uplink. HSDPA (High Speed Downlink Packet Access) and HSUPA (High Speed Uplink Packet Access) offer breakthrough data speeds, theoretically up to 14.4 Mbps in downlink and up to 5.8 Mbps in uplink respectively.
HSUPA (High Speed Uplink Packet Access) extends the uplink capability, providing peak uplink data rates of 5.76Mbps (up from typically 384kbps maximum in today's networks) and reduced data latency.

Objectives

HSUPA fundamentals training course provides you with a comprehensive technical foundation in HSUPA analysis, design, implementation and testing (RF and MAC layers applied to mobile device, Node B (BS) and RNC)

UMTS (W-CDMA)

525: WiMAX Fundamentals

Duration: 2 Day(s)

WiMAX (Worldwide Interoperability for Microwave Access- IEEE 802.16) is a standards-based wireless MAN technology (an implementation of 802.16: 802.16-2004 and 802.16e) that provides high-throughput broadband connections. WiMAX can be used for a number of applications, including "last mile" broadband connections, hotspot and cellular backhaul, high-speed enterprise connectivity for businesses and mobile.

This 2-day course provides an overview of WiMax applications, technologies, architectural and standards. Other important topics such as protocol layers, QoS, throughput, security, coverage, capacity planning, interference, testing and interoperability, are discussed. Basic WiMAX architecture, RF theory, microwave, propagation, Link budget math, troubleshooting, security and QoS foundations and site survey are explored.

After a general introduction to wireless networks, this practical course moves quickly into the WiMax (802.16-2004, 802.16e) foundations, protocols, PHY, MAC (Media Access Control), framing, TDD/FDD, FDMA/OFDMA/SOFDMA, QoS, security, mobility and CSN/ASN. Real-world experiences through case studies, vendor products, and implementation tips located throughout the course reference material.

Objectives

After successfully completing the course the students will:

- Understand the basic concepts of 802.16-2004 and 802.16e
- Understand 802.16-2004 and 802.16e Protocols (PHY, MAC)
- Understand the technical implementation of different types of 802.16-2004 and 802.16e
- Understand 802.16-2004 and 802.16e RF concepts and core network
- Gain a general understanding of WiMAX systems planning, coverage and capacity and design
- Gain a general understanding of WiMAX core planning and implementation (Data, TDM, VoIP, IPTV, and IMS)
- Be able to select the most effective WiMAX type from a wide assortment of recent and emerging implementations
- Be able to perform a more efficient design and operational support of WiMAX

Course 526: WiMAX RF Planning and Network Design

Duration: 3 Day(s)

WiMAX (Worldwide Interoperability for Microwave Access- IEEE 802.16) is a standards-based wireless technology (an implementation of 802.16: 802.16-2004 and 802.16e) that provides high-throughput broadband connections. WiMAX can be used for a number of applications, including "last mile" broadband connections, hotspot and cellular backhaul, and high-speed enterprise connectivity for businesses.

This course provides a detailed technical view of WiMax RF Planning and Network Design. It is an advanced course reviewing the technical specifications and standards from a RF Network Planning and Implementation point of view.

This course provides an overview of WiMax RF, technologies, applications and standards. Other important topics such as protocol layers, QoS, throughput, coverage, capacity planning, testing, interoperability, interference and security are discussed. Basic RF theory, microwave, LOS, NLOS, Link budget math, troubleshooting foundations and site survey are explored.

After a general introduction to wireless networks, this practical course moves quickly into the WiMax (802.16-2004, 802.16e) protocols, PHY, MAC (Media Access Control), framing, TDD/FDD, FDMA/OFDMA, RF planning and design. Real-world experiences through case studies and implementation tips located throughout the course reference material.

Objectives

After successfully completing the course the student will:

- Understand the basic concepts of 802.16-2004 and 802.16e
- Understand 802.16-2004 and 802.16e Protocols (PHY, MAC)
- Understand the technical implementation of different types of 802.16-2004 and 802.16e
- Understand 802.16-2004 and 802.16e RF concepts and issues
- Explore all relevant and important topics from basic RF theory to link budget math
- Explore WiMAX RF regulations, design, deployment and optimization
- Gain a general understanding of WiMAX RF planning, coverage and capacity
- Be able to select the most effective WiMAX type from a wide assortment of recent and emerging implementations
- Be able to perform a more efficient RF design and operational support of WiMAX

Prerequisites: Basic understanding of wireless, radio communications and IP is recommended.

For detailed information: *http://www.tonex.com/Courses/526/*

528: WiMAX Equipment and Component Design

Duration: 3 Day(s)

WiMAX (Worldwide Interoperability for Microwave Access- IEEE 802.16) is a standards-based wireless technology (an implementation of 802.16: 802.16-2004 and 802.16e) that provides high-throughput broadband connections. WiMAX can be used for a number of applications, including "last mile" broadband connections, hotspot and cellular backhaul, and high-speed enterprise connectivity for businesses.

This course provides a detailed technical view of WiMax component and network equipment esign. It is an advanced course reviewing the technical specifications and standards from a design point of view.

After a general introduction to wireless networks, this practical course moves quickly into the WiMax (802.16-2004, 802.16e) protocols, PHY, MAC (Media Access Control), framing, TDD/FDD, FDMA/OFDMA, planning and design. Real-world experiences through case studies and implementation tips located throughout the course reference material.

Objectives

After successfully completing the course the student will:

- Understand the basic concepts of 802.16-2004 and 802.16e
- Understand 802.16-2004 and 802.16e Protocols (PHY, MAC)
- Understand the technical implementation of different types of 802.16-2004 and 802.16e
- Understand 802.16-2004 and 802.16e RF concepts and issues
- Explore all relevant and important topics from basic RF theory to link budget math
- Gain a good knowledge on WiMAX network equipment and ASIC design and implementation
- Be able to select the most effective WiMAX type from a wide assortment of recent and emerging implementations
- Be able to perform a more efficient design and implementation support of WiMAX ASICs and equipments

529: WiMAX Network Management

Duration: 2 Day(s)

This course familiarizes the participants to features and tools to manage the performance of their WiMAX networks. WiMAX network equipment offers a set of performance features such as on-demand bandwidth management. This course begins with a discussion of the WiMAX/802.16 fundamentals and then explains the WiMAX network statistics, configurable network parameters as well as optional features, and shows how these affect each aspect of the WiMAX network performance.

In this 2-Day course, you will study the architecture, features and tools to optimize 802.16/WiMAX networks. You'll become familiar with creating users, logical views, event monitoring and collecting performance data. You'll perform agent updates, config and backup / restore operations.

Objectives

After completing this course, the student will be able to:

- Understand the basic principles of network management
- Describe the configuration parameters available and their impact on WiMAX network operations
- Interpret key WiMAX network performance measurements
- Explain how to engineer and dimension the WiMAX channels
- Measure the latency and average throughput in the network
- Describe the Quality of Service (QoS) features of WiMAX
- Implement Quality of Service (QoS) on a WiMAX device

Prerequisites: WiMAX Fundamentals

For detailed information: *http://www.tonex.com/Courses/529/*

530: WiMAX Core/IP Network Design and Implementation

Duration: 3 Day(s)

WiMAX (Worldwide Interoperability for Microwave Access- IEEE 802.16) is a standards-based wireless technology (an implementation of 802.16: 802.16-2004 and 802.16e) that provides high-throughput broadband connections. WiMAX can be used for a number of applications, including "last mile" broadband connections, hotspot and cellular backhaul, and high-speed enterprise connectivity for businesses.

This course provides an overview of WiMax core network technologies and standards. Other important topics such as protocol layers, QoS, throughput, network planning, traffic engineering, testing and security are discussed.

After a general introduction to wireless networks, this practical course moves quickly into the WiMax (802.16-2004, 802.16e) core network planning, design, implementation, security, QoS and mobility issues. Real-world experiences through case studies and implementation tips located throughout the course reference material.

This program combines dynamic expert presentations, live discussions on real-life situations faced by participants, case studies and hands-on workshops adapted to the business and organizational realities of participants. Complete training material is provided to all participants for future references and follow-up action plans.

Objectives

This course provides the fundamental principles of WiMAX core network planning, design, traffic engineering and implementation. It provides the knowledge necessary to evaluate WiMAX core network solutions, network design associated with traffic engineering for TDM, VoIP, IPTV and broadband data.

After successfully completing the course the student will:

- Understand the basic concepts of 802.16-2004 and 802.16e access technologies
- Understand the technical implementation of different types of 802.16-2004 and 802.16e
- Provide an essential introduction to WiMAX current and emerging voice, data and video technologies
- Gain a general understanding of WiMAX network planning, coverage and capacity
- Explore the requirements and the actions to take for the WiMAX planning, design and deployment
- Explore the latest enabling technologies, such as voice characteristics, compression standards and quality of service (QoS) used in VoIP implementation of WiMAX
- Be able to select the most effective WiMAX core network type from a wide assortment of recent and emerging implementations
- Be able to perform a more efficient design and operational support of WiMAX core network

Prerequisites: Basic understanding of TDM and IP is networks is recommended.

For detailed information: *http://www.tonex.com/Courses/530/*

531: 802.16e (WiMAX) Fundamentals

Duration: 3 Day(s)

802.16e is an amendment to IEEE Standard 802.16 ("Air Interface for Fixed Broadband Wireless Access Systems") as modified by IEEE Standards 802.16a, 802.16-2004 and 802.16c. The 802.16e covers "Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands. The emerging 802.16e standard will specify new mobile air interfaces for wireless broadband. 802.16e will add mobility in the 2 to 6 GHz licensed bands.

This course provides an overview of 802.16e.

Objectives

After successfully completing the course the student will:

- Understand the basic concepts of 802.16-2004
- Understand the basic concepts of 802.16e
- Understand 802.16e Protocols (PHY, MAC)
- Understand OFDMA and SOFDMA Techniques
- Understand the technical implementation 802.16e
- Understand 802.16e RF concepts and issues
- Gain a general understanding of 802.16e systems planning, coverage and capacity
- Be able to select the most effective WiMAX type from a wide assortment of recent and emerging implementations
- Be able to perform a more efficient design and operational support of 802.16e implementation of WiMAX
- Gain a general understanding of similarities and differences between 802.16e and WiBro

Prerequisites: Basic understanding of WiMAX and 802.16-2004 is recommended but not necessary.

For detailed information: *http://www.tonex.com/Courses/531/*

590: 4G Wireless Fundamentals

Duration: 2 Day(s)

This course will provide a comprehensive coverage of the technologies behind the 4G mobile system including Multicarrier-CDMA (MC-CDMA), Orthogonal frequency-division multiplexing (OFDM), Orthogonal frequency-division multiplexing (OFDM), Multiple-Input Multiple-Output (MIMO), Software Defined Radio (SDR), Ultra Wide Band (UWB), Long Term Evolution (LTE) and more. It analyses and discusses all relevant 4G technologies in one coherent framework. You will be guided from 3G to 4G where you will learn about 4G qualities and characteristics, and realize how 4G can support us with higher data transferring rates.

Objectives

Upon completion of this course, the participant will:

- Have a comprehensive overview of 4G infrastructure and functionality needed for providing 4G services to mobile end-users.
- Understand the concept of 4G and have a wider view of the 4G mobile telecommunications system.
- Understand the different radio access technologies as well as the platform for building services.
- The Wireless World Beyond Third generation
- The Evolution of 3G Networks towards 4G Mobile Communications
- 4G Business Model and Potential Services and Applications
- Concepts behind OFDM (Orthogonal Frequency Division Multiplexing) and OFDMA
- Overview of 4G Radio and Access Networks
- Ultra Wideband (UWB) Technology in 4G
- 4G as an Enabler of Seamless Data Service Delivery
- Learn more about 802.16e/Mobile WiMAX and WiBRO

Wireless Security

6030: Wireless LANs Security Fundamentals

Duration: 3 Day(s)

This TONEX two-day wireless LAN security course is cutting edge training in wireless LAN security technologies.

Objectives

The purpose of the course is to give you a full understanding of what wireless (802.11) networks are, how they work, how people find them and exploit them, and how they can be secured. This course is based on real world examples, solutions, and deployments. All material is developed and taught by individuals with extensive experience in wireless security research. Each student is supplied a CD-ROM with the latest tools, software, and documentation.

Wireless LAN Security Training includes:

- Exploring 802.11a, 8011.b and 802.11g Network Architecture and Design
- Understanding 802.11 Security Threats
- Security Management, Wireless LAN Intrusion and Policy
- Overview of security software and protocols for wireless LANs
- Exploring of the security weaknesses of and threats to wireless LANs
- Overview of implementation of the best and latest security techniques and mechanisms
- Implementation of WEP, WPA, WPA2, 802.11i and 802.1x

Prerequisites: Attendees should be familiar with TCP/IP and basic networking.

For detailed information: *http://www.tonex.com/Courses/6030/*

6033: GSM, GPRS and UMTS Security

Duration: 2 Day(s)

Having completed this course the participant will be able to understand how security is implemented, deployed and managed in GSM, GPRS and UMTS networks, understand security concepts, understand the benefits of new security techniques applied and how they are implemented.

Objectives

The goal of this course is to give the participant a strong and intuitive understanding of what security in the wireless systems is and how the security functions are implemented in the GSM/GPRS/UMTS radio and core network. The course focuses both on the air interface and the core network.

Prerequisites: General knowledge of GSM, GPRS and UMTS networks.

For detailed information: *http://www.tonex.com/Courses/6033/*

6034: CDMA2000 (1xEV-DO and 1xEV-DV) Security

Duration: 2 Day(s)

Having completed this course the participant will be able to understand how security is implemented, deployed and managed in IS-95 and CDMA2000 (1x-EV-DO and 1xEV-DV) networks, understand security concepts, understand the benefits of new security techniques applied and how they are implemented.

Objectives

The goal of this course is to give the participant a strong and intuitive understanding of what security in the wireless systems is and how the security functions are implemented in the CDMA radio and core network. The course focuses both on the air interface and the core network.

- The detailed descriptions of the security in the context of IS-95 and CDMA2000 (1x-EV-DO and 1xEV-DV) platforms
- A detailed description of security architecture
- Principles behind security
- Detailed descriptions and comparison of the cryptographic solutions in GSM/GPRS/UMTS and CDMA family
- Weaknesses in IS-95, 1x-EV-DO and 1xEV-DV security mechanisms
- New security features

Prerequisites: General knowledge of IS-95 and CDMA2000 networks.

For detailed information: *http://www.tonex.com/Courses/6034/*

Long Term Evolution (LTE)

580: LTE (Long Term Evolution) Training Boot Camp

Duration: 3 Day(s)

TONEX LTE (Long Term Evolution) Training Boot Camp ® is the answer to your LTE-EPC/EPS technology needs. This innovative and intensive learning experience covers the essential elements of LTE and SAE/EPC/EPS in a nutshell by the industry experts.

LTE (Long Term Evolution) Training Bootcamp can ombine the following training courses into a 4-days intense bootcamp based on the customer needs and requirements:

- OFDM and MIMO Training
- LTE Air Interface and Core Network Training
- LTE Core Network Planning and Design Training
- LTE RF Planning and Design Training
- LTE Protocols and Signaling Training
- LTE RAN Signaling and Operations for 1x/1xEV-DO and UMTS Training
- LTE RF Performance Training
- LTE QoS Training
- LTE Capacity Planning and Traffic Engineering Training
- LTE Security
- LTE GSM/UMTS and 1x/1xEV-DO (eHRPD) Interworking Training
- IPv6 and MPLS Training
- LTE-Advanced (R10) Training
- IMS and Voice over IMS for LTE-EPC Training

Objectives

Upon completion of this training, the attendees will be able to :

- Understand HSPA/HSPA+ and Migration to LTE/EPC/EPS
- Understand how Different End User Services are Performed in LTE/EPC/EPS
- Understand and Comprehend the basics of LTE/EPC/EPS
- Understand HSPA, HSPA+ and LTE Architecture, Protocols and Signaling
- Understand LTE Network Architecture and Protocols (Radio and Core)
- Understand the Main Functionality in the Evolved UMTS Radio Access Network, E-UTRA/E-UTRAN or LTE
- Understand LTE Multiple Access Methods: OFDMA and SC-FDMA and MIMO
- Describe Evolved Packet Core (EPC), SAE (System Architecture Evolution) and Evolved Packet System (EPS)
- Describe UTRAN, All IP Network (AIPN) and E-UTRA/E-UTRAN architecture
- Highlight E-UTRA Air Interface and physical layer (downlink and uplink) functionalities and procedures
- Highlight E-UTRA Layer 2 and 3 Signaling Functionalities and Procedures
- Highlight LTE Planning and Design Procedures
- Identify LTE Interworking
- Identify the following aspects of LTE networks: Quality of Service (QoS), Call setup procedures, Mobility support, LTE and EPC Security Architecture
- Describe Call flows and operational scenarios in HSPA/HSPA+ and LTE

6032: HSPA/HSPA+ and LTE Security Training

Duration: 3 Day(s)

Having completed this course the participant will be able to understand how security is implemented, deployed and managed in GSM, EGPRS, UMTS, HSPA/HSPA+ and LTE networks, understand security concepts, understand the benefits of new security techniques applied and how they are implemented.

Objectives

The goal of this course is to give the participant a strong and intuitive understanding of what security in the wireless systems is and how the security functions are implemented in HSPA/HSPA+ and LTE radio and core network. The course focuses both on the air interface and the enhanced core network.

- The detailed descriptions of the security in the context of IS-95 and CDMA2000 (1x-EV-DO and 1xEV-DV) platforms
- A detailed description of security architecture
- Principles behind security
- Detailed descriptions and comparison of the cryptographic solutions in GSM/GPRS/UMTS and CDMA family
- Weaknesses in IS-95, 1x-EV-DO and 1xEV-DV security mechanisms
- New security features

Prerequisites: General knowledge of IS-95 and CDMA2000 networks.

For detailed information: *http://www.tonex.com/Courses/6034/*

Satellite Communications

512: Global Positioning System (GPS) Fundamentals

Duration: 2 Day(s)

This course introduces the fundamentals of Global Positioning System (GPS) systems. It addresses all aspects of the GPS, emphasizes GPS architecture and applications, examines the GPS signal structure, modulation, access technologies and covers the key types of measurement being utilized in the field today.

523: Satellite Communications (SATCOM) Fundamentals

Duration: 2 Day(s)

The general 2-day course provides an introduction to communications satellite technologies, services, orbital mechanics to satellite design and launch, configuration and installation of earth stations, the implementation of communications links, the set-up of the satellite network, the capabilities, and limitations of current satellites.

The popular and intensive course provides the attendees with an in-depth background of satellite communication techniques as well as a state of the art update on key emerging technologies and future systems.

It addresses all important aspects of the subject, including traffic, multiple-access techniques, link budgets, the spacecraft bus, and the orbits.

Objectives

After completing this course, attendees will be able to:

- Explain the basics of Satellite Communications (SATCOM)
- Understand new SATCOM services and features
- Understand modern satellite system design , multiple access, modulation and coding schemes
- Understand orbital aspects
- Step through propagation aspects and antennas
- Investigate the state of the art in new areas such as speech and video coding, satellite networking and satellite personal communications
- Understand satellites subsystem & launching
- Understand satellite link design and analysis
- Define Very Small Aperture Terminals (VSAT)
- Understand Non-geosynchronous systems (NGSO)
- Explore GPS & Mobile Systems (Voice, Data and Video)
- Explain Internet Applications (GEO/ NGSO options)
- Explore the SATCOM trends

5022: VSAT Technology Training Boot Camp

Duration: 3 Day(s)

The use of Very Small Aperture Terminal (VSAT) systems is growing throughout the world as a way of establishing private satellite communications networks for large organizations that have several widely dispersed locations, or providing higher bandwidth for the individual. Depending on bandwidth requirement (data speed and/or communications channels), VSAT systems can be relatively small and easily installed.

A VSAT is a two-way satellite ground station with a dish antenna that is smaller than 3 meters (most VSAT antennas range from 75 cm to 2.4 m). Very Small Aperture Terminals data rates typically range from narrowband up to 18 Mbit/s. Very Small Aperture Terminals access satellites in geosynchronous orbit to relay data from small remote earth stations (terminals) to other terminals (in mesh configurations) or master earth station "hubs" (in star configurations).

This intensive technical course provides the attendees with an in-depth background of VSAT techniques as well as a state of the art update on key emerging technologies and future systems.

VSAT technical boot camp details the technology of satellite communications, focusing on VSAT networks and how they compete with terrestrial alternatives. The fundamentals of Constituent parts of a VSAT configuration, planning, network architecture, orbits, link budget, coverage, ground equipment hardware, installation, operation, and maintenance are covered.

Objectives

Upon completing of this course, attendees will be able to:

- Explain the basics of Satellite Communications (SATCOM)
- Define Very Small Aperture Terminals (VSAT)
- Understand VSAT services and features
- Understand VSAT architecture, system design , multiple access, modulation and coding schemes
- Step through VSAT propagation aspects and antennas
- Investigate the state of the art in new areas such as speech and video coding, and VSAT networking
- Understand VSAT subsystem & launching
- Understand VSAT link design and analysis
- Explain TCP/IP, VoIP and Video applied to VSAT
- Understand VSAT-base IP communications technologies
- define VSAT voice, video and data applications
- Step through VSAT installation, operation, maintenance and Troubleshooting