**TRAINING WORKSHOPS**

**Associate Certified Electronics Technician (CETa)**

*Chris Miller, CETsr, Heartland Community College*

This two-day workshop is a comprehensive hands-on course that will give you all of the necessary skills in order to be successful in today's electronics industry and includes extensive hands-on training. If you are a student needing more in-depth information, a beginning technician needing expert guidance, or a practicing electronics technician wanting to enhance your skill level to advance in your career, this workshop will prepare you for success with ETA's Associate Certified Electronics Technician (CETa) certification exam.

**CETa technical topics:**

* Electrical Theory
* Electronic Components
* Soldering
* Desoldering Tools
* Block Diagrams
* Schematics
* Wiring Diagrams
* Cabling
* Power Supplies
* Test Equipment & Measurements
* Mathematics & Formulas
* Radio Communications Technology
* Safety Precautions
* Amplifiers
* Optical Electronics
* Electronic Circuits: Series & Parallel
* Interfacing of Electronics Products
* Digital Concepts & Circuitry
* Computer Electronics
* Computer Applications
* Audio & Visual Systems
* Telecommunications Basics

**Wednesday-Thursday, March 29-30, 2017 $369**

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**Communications Site Installer (R56)**

**Michael Barton, CETsr, Motorola R56 Audit Team & Commdex Consulting**

Based on the NEW Motorola updates of R56 industry codes and standards, this four-day workshop is for Motorola employees and affiliates only (unless invited and Motorola authorization given) that provides a documented set of standards & guidelines for designing safe and reliable communications sites helps guarantee personnel safety, equipment reliability and equipment availability. This hands-on workshop validates attendees knowledge or core concepts required in the installation of a communications site and explores all the NEW competencies recently introduced to ensure that communications sites are constructed to industry best practices and communications equipment operates in an environment that assures service reliability and longevity.

**R56 Course Outline:**

* *Avoid Network Downtime* - Lessen the likelihood of communications network downtime caused by non-compliance to R56 standards.
* *Promote Workplace Safety* - Ensure that sites meet the minimum standards so that site workers have a safe, working environment.
* *Lower Maintenance Costs* - Quickly uncover the major cause of equipment issues, lessening costs associated with troubleshooting to correct the problem.
* *Comprehensive Reports and Recommendations* - R56 auditor will generate a detailed report, including photos, which identifies any compliance issues and provides recommendations to get the site up to standard.

**Monday-Thursday, March 27-30, 2017 $1169 through 2/23 or $1259 late/onsite**

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**Distributed Antenna Systems (DAS)**

*Dane Brockmiller, FOI, LAS, PIM, Dover Telecommunication Services*

This two-day hands-on course is for technicians, managers and venue owners who need to understand the role of DAS in wireless today. This is a comprehensive hands-on course covering the six major areas of DAS, small cell, applications and deployments (noted below in detail).

Learn the latest development, installation and planning for VHF and UHF public safety DAS. Emphasis will be placed on the differences between this form of DAS and carrier-based systems along with how DAS interacts with wireless carriers and Wi-Fi. DAS coverage and component testing will be demonstrated along with plenty of hands-on exercises.

**DAS & Small Cells course outline:**

*Distributed Antenna Systems (DAS)*

• What is a DAS

• What is a Small Cell

• The Current Role

• 4G and 5G Wireless

• VHF and UHF DAS

*Making DAS Decisions*

• Scope and First Steps

• Site Surveys

• Site or Building Planning

• Permissions – Access and Permits

• NFPA and Building Codes

*DAS Design Elements*

• Coverage Requirements

• Radio Environments - Obstructions

• Mechanical Issues

• Creating Site Maps

• Use of Fiber and Coaxial Cables

*Equipment Decisions*

• Fiber Equipment

• Donor Antennas

• Indoor Antennas

• Repeaters and BDAs

• Distribution Paths

• Coupling Devices

*DAS Installation*

• Coaxial Systems and Cables

• Amplifiers, Repeaters, Couplers,

 Splitters and Antennas

• System Configuration - Provisioning

*DAS Testing*

• Antenna Line Sweep Testing

• Passive Intermodulation Testing

• Coverage Surveys

• As-Built Documentation

**Monday/Tuesday, March 27-28, 2017 $809 through 2/23 or $855** **late/onsite**

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**Fiber to the Antenna (FTTA)**

*Phil Shoemaker, FOI, FOT-OSP, Light Brigade*

Fiber to the Antenna is intended for those who install, test and maintain fiber optic communication systems for Outside Plant FTTA installations and onsite antenna applications. Novice and experienced fiber professionals alike will find this workshop and extensive hands-on skills training beneficial for successful fiber optics careers with a practical understanding to properly install and maintain fiber optic networks. The four-day class includes 16 hours of classroom lecture combined with 16 hours of hands-on exercises.

The content focuses on the integration and installation of optical components in order to successfully establish connectivity in FTTA and cell tower applications. Attendees will participate in skills exercises that give practical hands-on experience with splicing, cable preparation, OTDR testing, and optical loss testing.

**FTTA course outline:**

• Fiber theory and terminology

• Single-mode fiber technology, including G.652D & G.657 fibers

• Multimode fiber technology, featuring OM3 & OM4 fibers

• Cleaning and inspection criteria

• Proper cable installation

• Optical loss testing procedures

• OTDR testing and troubleshooting

• Fusion and mechanical splicing

• Safety procedures

**Monday-Thursday, March 27-30, 2017 $1,665**

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**General Communications Technician - Level 1 (GCT1)**

*Rob Walker, LAS, PIM, ATRG Technical Services*

This certification program introduces public safety professionals and support staff to various communications concepts and technologies, including: interoperable communications solutions, LMR communications, satellite, telephone, data, and computer technologies used in incident response and planned events. This two-day workshop trains emergency responders on practices and procedures common to radio communication technicians during all-hazards emergency operations. This course will help communications technicians work within the Incident Command System (ICS) organizational structure. It is intended for federal, state, local, and tribal emergency response professionals and coordination/support personnel with communications backgrounds. Individuals who are responsible for managing a Strategic Technology Reserve (radio cache, mobile communications vehicle, or other deployable communications assets) are encouraged to attend.

GCT1 is modeled after communication systems basics and expands on the US Department of Homeland Security's Communications Technician program.

**GCT1 technical topics:**

* Basic Electronics
* Fundamentals of Radio
* Tools
* Test Equipment
* Power Systems
* Cabling & Installations
* Environmental Systems
* Antennas
* Transmission Lines
* Towers
* Operating Principles & Details on Radios & Radio Systems
* Serial Data and IP Networks
* Basics of Fiber Optic Lines & Systems
* Telephony
* Satellite Communications
* Physical Plant Considerations
* Site Procedures
* Safety Practices

**Monday/Tuesday, March 27-28, 2017 $629 through 2/23 or $** **719** **late/onsite**

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**Line Antenna Sweep (LAS)**

*Don Huston, CET, Bird Technologies*

This frequency domain reflectometer hands-on course is designed for beginners as well as senior-level technicians and engineers, this course goes beyond traditional line sweep and PIM testing and provides all the knowledge in order to test and evaluate RF signals that begin at the output of a radio transmitter and eventually are propagated into the air to a receiver. Hands-on exercises will include applications of everyday problems found in the field such as: testing fundamentals, reflectometers, RF wattmeters, calibration, determining problems, distance-to-fault measurements, system sweeps, FDR operation and troubleshooting.

**Technical topics:**

* Introduction to Antenna System Commissioning
* Radio Frequency (RF) Fundamentals
* Mathematics
* Coaxial Cable Fundamentals & Installations
* RF Connectors
* Antennas
* Frequency Domain Reflectometer Testing
* Operation & Test Interpretation
* Hands-on Troubleshooting

**Wednesday/Thursday, March 27-28, 2017 $809 through 2/23 or $** **855** **late/onsite**

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**Mobile Communications Electronics Installer (MCEI)**

*Chris Dalton, LAS, Radio System Analytics*

This three-day workshop includes basic knowledge concepts of land mobile radio (LMR) and associated electronics equipment installation that also incorporates required hands-on training skills applicable to all of the functions required to safely and completely install mobile communications and associated electronic equipment, including removal and reinstallation. MCEI certification ensures the installer has acquired the necessary fundamental skills to deliver more safety, compliance and efficiency through the use of onboard technology.

**Discussions include:**

* Mobile Installation Fundamentals
* Mechanical & Vehicle Basics
* Land Mobile Radio Fundamentals
* Basic Mobile Installation
* Post-installation Procedures

**Hands-on labs include:**

* Current, Voltage & Various Circuits within a Vehicle's Electrical System, including Fuses & Circuit Breakers
* Use of an Antenna & Cable Analyzer to Tune and Troubleshoot Mobile Antenna Installations
* Proper Drilling Practices through Sheet Metal & Carpets

**Monday-Wednesday, March 27-29, 2017 $989 through 2/23 or $1,079 late/onsite**

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**Microwave Radio Technician (MRT)**

*Tom Dover, Dover Telecommunication Services*

Microwave radio still plays a major role in radio and data transmission systems. Wireless carriers continue to deploy microwave systems for data backhaul, and with the advancement of LTE for public safety, the need for microwave communications continues to grow.

This two-day course is designed for students and professionals who encounter point-to-point radio at microwave frequencies. This is a comprehensive hands-on course focusing on how radio works in all applications, how digital transmission (modulation) is derived for high-speed dta, the principals of microwave frequency propagation and antenna systems. Much of this course will be devoted to hands-on testing and troubleshooting approaches for radio technicians. Federal regulators and OSHA RF safety training will also be covered.

**MRT course outline:**

*Introduction to Microwave*

• Why Microwave?

• Radio vs Fiber vs Cable

• Bandwidth, Attenuation & Noise

• Radio Regulation - FCC & NTIA

• dB and dBm

• Radio Frequency Safety Awareness

*Radio Interfaces*

• Types of Traffic

• T1 - DS3 - SONET

• Ethernet - IP Traffic

• Digital Modulation - Microwave

*Understanding Microwave Equipment*

• Transmitters

• Receivers

• Alarms

• Troubleshooting

• Maintenance

*Microwave Propagation & Antennas*

• Maxwell & Waves

• Fresnel Zone Clearance

• Wave Attenuation:

• Free Space Loss & Absorption

• Ducting & Fades

• Reflections & Multi-Paths

*Microwave Antenna Systems*

• Antenna Gain & Bandwidth

• Directivity & Beam Width

• Antenna Types & Connectors

• Waveguide & Coax

• Antenna Testing

*Link Budget and System Evaluation*

• Link Budget

• System Gain & Loss

• FCC & OSHA RF Safety

**Monday-Tuesday, March 27-28, 2017 $809 through 2/23 or $855 late/onsite**

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**Radio Frequency Interference and Mitigation (RFIM)**

*Ira Wiesenfeld P.E. CETsr, IWA Technical Services, Inc.*

This two-day course is for anyone involved with radio services, wireless or other types of communications systems. Delivered in a concise, systematic way that will enhance your skill level, regardless of your experience, this is a comprehensive hands-on course that will give you all of the necessary skills in order to find and correct RF signal interference. The class begins with basic theory of radio and test equipment, concluding with hands-on applications of everyday problems found in the field. Designed to include beginners as well as senior level technicians and engineers, this course goes beyond interference hunting.

**Discussions include:**

* Radio & Test Equipment Fundamentals
* Common and Uncommon Types of RFI
* Decibels
* Propagation Anomalies, Causes, Measurements & Cures
* Intermodulation
* Equipment
* Filters
* Antennas
* Blanking
* Capture
* Prevention
* Safety
* Other Fixes

**Hands-on exercises include:**

* Set-up
* Calibration & Testing Fundamentals
* Locating RFI with Service Monitors & Spectrum Analyzers
* Effective Sensitivity Receiver Measurements
* Discovering Blocking/Desense Situations
* Tuning Cavity Filters
* Measuring Harmonics
* Practicing Direction Finding Techniques
* Hunting for Power Line Noise
* Applying Resolutions

**Monday-Tuesday, March 27-28, 2017 $809 through 2/23 or $855 late/onsite**