

VERSION 2.0

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siae microelettronica

NORTH AMERICA REGION
PRODUCT TRAINING
SYLLABUS

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SYLLABUS

MICROWAVE 101

Overview	This section will provide an introduction to microwave radio, the history, and generic components that make up the microwave system.
Objective	The objective of this section is to understand microwaves wavelengths, the history of microwave solutions, and what applications can be served using microwave radio.
Time Allocated	15 minutes
Class Outline	I. What and Why II. History III. Components IV. Where microwave is deployed V. Traditional and Emerging Markets

MICROWAVE PRIMER

Overview	This section will provide an understanding all of the underlying components and foundation that make up the requirements for licensed microwave radio solutions.
Objective	The objective of this section is to understand what is required for licensed microwave and grasp all of the concepts that pertain to microwave radio transmission.
Time Allocated	30 minutes
Class Outline	I. FDD II. Line of Sight III. K- Factor IV. mW, dB, dBmw V. Understanding Transmit Power VI. Decibels VII. Modulation VIII. Adaptive Coding and Modulation IX. Center Frequencies X. Frequency Attenuation XI. Types of Noise XII. Sensitivity

ANTENNA SYSTEMS FOR MICROWAVE RADIO

Overview	This section will provide an understanding of antenna systems and the requirements for their use in licensed microwave.
Objective	The objective of this section is to understand what antennas are required for licensed microwave transmission.
Time Allocated	30 minutes
Class Outline	I. Antenna Interface II. Types of Antennas III. Omni vs. Directional IV. Calculate RX Power V. Polarity VI. Vertical vs Horizontal vs Circular VII. Antenna Pattern Interpretation VIII. EIRP IX. RSL RSSI X. Link Budget Calculation XI. SNR & C/I (1.0 Hour)

CHALLENGES AND SOLUTIONS IN MICROWAVE

Overview	This section will provide an understanding of the challenges faced when implementing a microwave radio solution and suggestions on overcoming these obstacles.
Objective	The objective of this section is to understand the concepts of attenuation, fading and interference, and how designers can overcome this phenomenon in planning the microwave link.
Time Allocated	30 minutes
Class Outline	I. Overview of the challenges II. What causes attenuation & solutions III. Fading and Polarization Shift IV. Dispersion and suggestions V. Ducting a. Spatial Diversity VI. Interference

SIAE MICROELETTRONICA LINK CALCULATION TOOL

Overview	This section will provide a basic understanding of the SIAE path estimation tool and how to estimate systems and the requirements for their use in licensed microwave.
Objective	Objective of this section is ensuring the student is proficient in using the SIAE path estimation tool.
Time Allocated	15 minutes
Class Outline	I. A high level overview of the capabilities II. Path Estimation using distance and GPS III. Importing Google Earth Coordinates IV. Exporting Results

ANTENNA ALIGNMENT

Overview	This section will provide the student with the fundamentals of how to align a microwave antenna system; discuss the tools and methodology necessary to provide proper system alignment.
Objective	The objective of this section is ensuring proficiency aligning antennas supplied by SIAE.
Time Allocated	30 minutes
Class Outline	I. Overview of Alignment II. Manual and locating the adjustment for Azimuth and Tilt. III. Calculations for alignment IV. Do's and Do NOT's V. Link Budget Calculation VI. Angles and Up-Tilt over distance VII. Precision Compass and Inclinometer VIII. Tools required IX. Voltmeter and Alignment Cable X. Target RX Level XI. Compass Declination XII. Declination Calculation Example XIII. NOAA Website and Declination Calculator XIV. Antenna pattern specifics and side lobe verification XV. The "X-Plus" method of fine adjustment

NETWORKING AND VLANS

Overview	This section will provide the student with the fundamental understanding of what VLAN's are, how they are used, and specifically how they are used in the SIAE microwave radio network.
Objective	The objective of this section is ensuring proficiency when configuring VLAN's using SIAE microwave radios.
Time Allocated	15 minutes
Class Outline	I. Default IP Addresses and Masks II. Default User and Passwords III. VLAN's – What and Why? IV. VLAN Example V. Hub vs Switched with VLAN's VI. SIAE and VLAN's

ESTABLISHING A LINK (LINE-UP)

Overview	This section will provide the student with the fundamental understanding of the setup, and establishment of a link for the various products in the SIAE portfolio
Objective	The objective of this section is to provide the student with all of the necessary steps to configure a first-time link for many of the products. Pay particular attention the differences in the various operating systems, such as SM-OS. Also, many of the same configurations will be shown using the necessary command line commands.
Time Allocated	60 minutes
Class Outline	I. ALFOplus II. ALFOplus 80 & 80HD / ALFOplus2 III. AGS20

LINK AGGREGATION (LACP) AND 2+0 MANAGEMENT

Overview	This section will provide the student with the fundamental understanding of the setup, and establishment of LACP using the AGS 20.
Objective	The objective of this section is to provide the student with all of the necessary steps to configure LACP using the AGS 20. Also shown will be the necessary command line commands for Cisco Port Channel.
Time Allocated	60 minutes
Class Outline	I. 2+0 Management Networking II. LACP and AGS20 III. Cisco Port Channel and SIAE LACP

LABORATORY ASSIGNMENTS

SIAE Training Classes allow ample opportunity for students to get hands-on the equipment. Below are details of the lab assignments that students will accomplish during the class.

LAB #1 – ASSIGNING IP ADDRESS

Overview	In this exercise the student will successfully configure the IP address and subnet masks of both radios for the link.
Objective	The objective of this lab is to successfully change the IP address of both the local and remote radios.
Time Allocated	15 minutes

LAB #2 – ESTABLISH A RADIO LINK

Overview	In this exercise the student will successfully configure a radio link (frequency, power, ID, etc.), and enable Adaptive Code Modulation, and Automatic Transmit Power Control.
Objective	The objective of this exercise is to establish a radio link and enable the advanced radios features such as ACM. Validate the link and verify you can manage the other radio
Time Allocated	15 minutes

LAB #3 – RADIO RESCUE CONNECTION

Overview	In this exercise the student will establish a Rescue Connection to the radio and recover it from a problem state.
Objective	The objective of this exercise is to utilize the rescue procedure to recover the radios back to a useable state, validate the link and pass traffic,
Time Allocated	30 minutes

LAB #4 – PERFORMANCE TESTING

Overview	In this exercise the student will gain familiarity with IPERF as a means to test performance and perhaps troubleshoot in the future.
Objective	The objective of this lab is to successfully perform multiple performance tests across the link using IPERF to evaluate capacity.
Time Allocated	30 minutes

LAB #5 – B.E.R., PRBS AND LOOPBACK FUNCTIONS

Overview	In this exercise the student will get familiar with the Bit Error Rate, PRBS, and Loopback functionality and location of SIAE radios.
Objective	The objective of this exercise is to utilize the Bit Error Rate Testing functionality. Additionally, the student will observe SIAE can enable the BER Test functionality and still carry live traffic. The student will successfully verify this functionality as well.
Time Allocated	30 minutes

LAB #6 – CHANGING MTU / JUMBO FRAMES

Overview	In this exercise the student will successfully change the MTU on the various interfaces to allow for larger and jumbo frame sizes.
Objective	The objective of this exercise is to ensure that the student is proficient in setting various frame sizes and jumbo frame sizes to successfully pass traffic.
Time Allocated	30 minutes

LAB #7 – BACKUP CONFIGURATION AND INVENTORY REPORTS

Overview	In this exercise the student will back up the configuration files of both radios and show or email them to the instructor. Additionally, the student will also submit the inventory reports and alarm reports. A record of all software versions will be taken.
Objective	The objective of this lab is to successfully download numerous reports and evaluate the information contained noting the various configuration and alarm information.
Time Allocated	30 minutes

LAB #8 – ANTENNA ALIGNMENT

Overview	In this exercise the student will successfully align a radio link by manually adjusting the antennas in the lab area.
Objective	The objective of this exercise is to successfully establish a radio link by aligning the antennas for the path within the specified tolerances.
Time Allocated	30 minutes