ABB University Switzerland

ABB Switzerland Ltd
LC Communication Networks
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Baden
1  LC Business Processes and Personal Development
   LC Communication Networks
   LC Substation Automation and Protection
   LC Power Generation
   LC Information Systems Applications
2  LC Management and Leadership Development
3  LC Robotics
# ABB University Switzerland
## Course Schedule 2014

### Communication Networks

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Code</th>
<th>Days</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>Utility Communications - Fundamentals</td>
<td>CHP511</td>
<td>3</td>
<td>Wed-Fri</td>
</tr>
<tr>
<td>Distribution Communication Solutions</td>
<td>CHP516</td>
<td>3</td>
<td>on request</td>
</tr>
<tr>
<td>Broadband Communication Networks</td>
<td>CHP520</td>
<td>2</td>
<td>Thu-Fri</td>
</tr>
<tr>
<td>Ethernet Switching and TCP/IP - Introduction</td>
<td>CHP522</td>
<td>2</td>
<td>Mon-Tue</td>
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<tr>
<td>Wireless Communication - Introduction</td>
<td>CHP523</td>
<td>2</td>
<td>on request</td>
</tr>
<tr>
<td>Power System Technology - Fundamentals</td>
<td>CHP510</td>
<td>5</td>
<td>Mon-Fri</td>
</tr>
</tbody>
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### Product Courses

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Code</th>
<th>Days</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>FOXMAN-EM Network Management System</td>
<td>CHP549</td>
<td>1</td>
<td>on request</td>
</tr>
<tr>
<td>FOX51SH &amp; Its Multiservice Utility-Multiplexer</td>
<td>CHP552</td>
<td>3</td>
<td>Mon-Wed</td>
</tr>
<tr>
<td>FOX505 Access Multiplexer</td>
<td>CHP553</td>
<td>4</td>
<td>Tue-Fri</td>
</tr>
<tr>
<td>FOXView Enterprise Network Management System</td>
<td>CHP554</td>
<td>1</td>
<td>Thu</td>
</tr>
<tr>
<td>FOX660 Multiservice Utility-Multiplexer</td>
<td>CHP566</td>
<td>3</td>
<td>Mon-Wed</td>
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<tr>
<td>AFS600 Switch Family</td>
<td>CHP568</td>
<td>3</td>
<td>Wed-Fri</td>
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<tr>
<td>AFR977 Router</td>
<td>CHP559</td>
<td>3</td>
<td>Mon-Wed</td>
</tr>
<tr>
<td>AFR Firewall</td>
<td>CHP560</td>
<td>2</td>
<td>on request</td>
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<tr>
<td>AFSView Network Management System</td>
<td>CHP561</td>
<td>1</td>
<td>Thu</td>
</tr>
<tr>
<td>ETU600 R4 Universal Digital PLC Equipment</td>
<td>CHP568</td>
<td>5</td>
<td>Mon-Fri</td>
</tr>
<tr>
<td>ETU600 R4 for Experienced ETU600 RS Users</td>
<td>CHP560</td>
<td>2</td>
<td>Mon-Tue</td>
</tr>
<tr>
<td>NSD570 Teleprotection Equipment</td>
<td>CHP570</td>
<td>5</td>
<td>Mon-Fri</td>
</tr>
<tr>
<td>RTBOX SCADA Radio Modem Family</td>
<td>CHP574</td>
<td>5</td>
<td>Mon-Wed</td>
</tr>
<tr>
<td>Tropos Wireless Mesh Networks</td>
<td>CHP580</td>
<td>3</td>
<td>on request</td>
</tr>
<tr>
<td>SIS200 SIRINET Telephone System</td>
<td>CHP582</td>
<td>5</td>
<td>Mon-Thur</td>
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<tr>
<td>SIS200 SIRINET Trunk Routing and Advanced Features</td>
<td>CHP586</td>
<td>5</td>
<td>Mon-Fri</td>
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<tr>
<td>FOX15 Access/Transport Multiplexer</td>
<td>CHP592</td>
<td>5</td>
<td>Mon-Fri</td>
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<tr>
<td>FOXMAN-UN Network Management System</td>
<td>CHP593</td>
<td>3</td>
<td>Mon-Wed</td>
</tr>
<tr>
<td>FOX15 Utility Grade Universal Access/Transport Multiplexer</td>
<td>CHP595</td>
<td>5</td>
<td>Mon-Fri</td>
</tr>
<tr>
<td>FOX15 for Experienced FOX15 Users</td>
<td>CHP596</td>
<td>5</td>
<td>Mon-Fri</td>
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</table>

**Legend:**
- E = English
- G = German
- = public holiday

**Organising Learning Centre (LO):**

- = LC Communication Networks, Baden
- = LC Substation Automation and Protection, Baden

**The latest version of our course schedule can be found on Internet:**
[www.abb.ch/abbuniversity](http://www.abb.ch/abbuniversity)
“Take the right train”
Course Selection Table

The course selection table shows: course number (CHP...), title, duration, prerequisites and the page of the course for description. The general course dependency over the different groups of courses (Basic, Product, Product (Advanced) and Network Management System) is also shown. Furthermore, the typical target group for each type of course groups is defined according to the field of activity of participants.

For course details please consider the course description in our website: http://www.abb.ch/abbuniversity/courses.aspx and choose under Product group/Industry --- "Utility Communication Products".

Basic

The basic courses provide a thorough introduction to different technologies used in utility communication networks as well as an introduction to the corresponding ABB’s product portfolio.

Product

The product courses provides a thorough and practical introduction to equipment available in the ABB Communication Networks products portfolio. The participants learn the architecture and the most widely used interfaces and options of the corresponding equipment. They also learn how to configure and maintain the equipment in a network.

Product (Advanced)

The participants acquire in depth knowledge in advanced product features or in a new product release or in a product family equipment, which requires high knowledge, experience and normally a course participation to the respective or prior Product(Family) course.

Network Management System

The Network Management System courses provide a thorough and practical introduction to Network Management Systems. The participants learn the architecture and the different functions of the corresponding Network Management System. They also learn how to configure the Network Management System and to manage the corresponding ABB supplied Network Elements.

Typical Target Group Client:
Executives, Planning personnel, System engineers, Commissioning personnel, Maintenance personnel, Operators and Consultants

Typical Target Group ABB Personnel:
Managers, Sales personnel, Project managers, Engineering personnel, Testing personnel, Commissioning personnel and Service personnel

Typical Target Group Client:
Planning personnel, System engineers, Commissioning personnel, Maintenance personnel and Operators

Typical Target Group ABB Personnel:
Engineering personnel, Testing personnel, Commissioning personnel and Service personnel

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**Communication Networks Courses**

**Typical Target Group Client:**
Executives, Planning personnel, System engineers, Commissioning personnel, Maintenance personnel, Operators and Consultants

**Typical Target Group ABB Personnel:**
Managers, Sales personnel, Project managers, Engineering personnel, Testing personnel, Commissioning personnel and Service personnel

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### Basic

**CHP511**
Page 7
Utility Communications – Fundamentals

**CHP516**
Page 7
Distribution Communication Solutions

**CHP520**
Page 7
Broadband Communication Networks

**CHP522**
Page 8
Ethernet Switching and TCP/IP – Introduction

**CHP523**
Page 8
Wireless Communication – Introduction

**CHS100**
Page 8
Power System Technology – Fundamentals

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### Product

**CHP552**
Page 9
D0XS10H & Hs Multiservice Utility Multiplexer

**CHP553**
Page 10
D0X500 Access Multiplexer

**CHP556**
Page 11
D0X960 Multiservice Utility Multiplexer

**CHP558**
Page 11
AF9500 Switch Family

**CHP568**
Page 13
ETL600 R3 Universal Digital PLC Equipment

**CHP570**
Page 14
ETL600 R4 Universal Digital PLC Equipment

**CHP574**
Page 14
NSD570 Teleprotection Equipment

**CHP580**
Page 14
Airbox SCADA Radio Modem Family

**CHP582**
Page 15
Tripos Wireless Mesh Networks

**CHP585**
Page 15
S0300 SPARENET Telephone System

**CHP592**
Page 16
D0X15 Access/Transport Multiplexer

**CHP595**
Page 17
D0X815 Utility Grade Universal Access/Transport Multiplexer

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### Product (Advanced)

**CHP559**
Page 11
AF9577 Router

**CHP560**
Page 12
AF7 4500 Access

**CHP569**
Page 13
ETL600 R4 for Experienced ETL600 R3 Users

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**Network Management System**

**CHP567**
Page 16
S0300 SPARENET Traffic Routing and Advanced Features

**CHP596**
Page 18
FOX10 for Experienced FOX15 Users

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**CHP548**
Page 9
FORMAN-EM Network Management System

**CHP554**
Page 10
FOXwin Enterprise Network Management System

**CHP561**
Page 12
AT-SWEE Network Management System

**CHP599**
Page 17
FORMAN-UN Network Management System

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Page # = Page of course description
CHP11 = Previous course is recommended
CHP11 = Previous course or equal knowledge is required!
# Enrolment form

**Personal details**

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<tr>
<th>Title / Job function</th>
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<th>Surname</th>
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**Course details**

<table>
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Do you need a letter of invitation for a visa application?  
Yes* No

Do you need any assistance with the booking of accommodation?  
Yes* No

* We will contact you for further information.

**Company details**

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<tr>
<th>Company name</th>
<th>Street / Number</th>
<th>Postal code / Town</th>
<th>Country</th>
<th>Phone (main)</th>
<th>Fax (main)</th>
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</table>

For ABB companies only  
(Please check with your financial department)

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<tr>
<th>CIT (eg, CHPAU)</th>
<th>PG (eg, 2875)</th>
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</thead>
</table>

By returning this completed form you accept the general terms and conditions on page 8/9 in part 1 of our course program, ie, in case of cancelations or deferrals a cancelation fee may be charged. Completed enrolment forms are treated like an official purchase order and are binding.

Place and date  
Signature
CHP511
Utility Communications – Fundamentals

Course goal
This modular course provides a thorough introduction to the technologies used in utility communication networks as well as an introduction to ABB’s product portfolio for utility communications. After the successful completion of the course, the participant will have a clear understanding of the different services and technologies (voice, data, and teleprotection) and the architecture of utility communication networks.

Learning objectives
- Describe typical utility communication network structure
- List the different applications and their components
- Identify the different technologies used in utility communication networks

Participants
Project managers, sales engineers, main contractors, junior system engineers, junior development engineers

Prerequisites
General engineering background

Topics
Day 1:
- Utility Communication Networks Overview
- Fiber Optics Technology
- Introduction to PDH (E1/PCM30)
- Introduction to SDH Technology

Day 2:
- Fundamentals of Power Line Carriers
- Applications: Power Line Carrier
- Introduction to Ethernet and TCP/IP communications and applications
- Introduction to Wireless communications and applications

Day 3:
- Applications: Teleprotection
- Telecom Network Management
- Applications: Telephony

Methods
Lectures, demo and practical exercises

Duration
3 days (attendance on selected course days is possible)

CHP520
Broadband Communication Networks

Course goal
This course provides a thorough introduction to fiber optics and broadband communication networks as well as an overview of ABB’s respective products portfolio. After the successful completion of the course, the participant will have a clear understanding of the network elements and the architecture of broadband networks.

Learning objectives
- Describe typical broadband communication network architecture
- List ABB’s respective products portfolio
- Have a clear understanding of the network elements used in broadband networks

Participants
Project managers, sales engineers, main contractors, junior system engineers, junior development engineers
Communication Networks

Prerequisites
General engineering background

Topics
- Fiber Optics
- SDH/PDH
- SDH and PDH Multiplexers
- Network Architecture
- IP integration into broadband networks
- Network Management Systems

Methods
Lectures

Duration
2 days

CHP523
Wireless Communication – Introduction

Course goal
This course provides a thorough introduction to Wireless Communications used in Utility Communications as well as an overview of ABB’s respective products portfolio.

Learning objectives
- Understand the principles of Wireless Communication
- Get an overview of the different Wireless Communication technologies used in Utility Communications networks
- List the difference between the technologies
- Understand the technical challenges of Wireless Communication
- List ABB’s respective products portfolio

Participants
System engineers, commissioning engineers, development engineers, test engineers

Prerequisites
General engineering background

Topics
- Radio Propagation
- RF Terminology
- Modulation and Multiple Access Techniques
- Wireless Technologies used in Utility Communications
- Applications for Wireless Technologies in Utility Communications
- Antennas and Feeders
- Frequency Spectrum
- Licensed and Unlicensed System

Methods
Lectures

Duration
2 days

CHS100
Power System Technology – Fundamentals

Course goal
The participants become familiar with the electrical power system and all its components and features. This familiarization is the basis for all engineering and operating activities in power systems. They are introduced to the fundamentals of today’s technologies in substations (switchgear), substation automation including protection, communication and power system management.

Prerequisites
General engineering background

Topics
- Fiber Optics
- SDH/PDH
- SDH and PDH Multiplexers
- Network Architecture
- IP integration into broadband networks
- Network Management Systems

Methods
Lectures, demo and practical exercises

Duration
2 days
Communication Networks

Learning objectives
- Describe the power system structure and behavior
- Explain the different configurations of substations and their components
- List the functions of the automation and protection system
- Explain typical substation automation system structures
- Describe the most common protection schemes
- Explain how the primary system (switchgear) is interfaced with the substation automation system
- Describe the different means for the communication in power systems
- Describe the basics of network management

Participants
Consultants and employees from the electricity supply industry. Personnel from ABB companies.
Note: This course is designed for newcomers in the area of power system technology.

Prerequisites
College qualification or equivalent.

Topics
- Power system description
  Voltage levels, substations as power grid nodes
  Transmission vs. distribution power systems
  Power system faults and disturbances
  Network equations and state estimation, network stability,
  Generation, active and reactive power, P-V relationship, Q-V relationship, Power quality
  Principles of power system management
  Idea and concept of Smart-grids
- Substations and their components
  Fundamentals of substation design and their components
  High voltage switchgear installations with air (AIS) and SF6 gas insulation (GIS), innovative switchgear solutions
  Single line configurations for transmission (HV) and distribution (MV)
- Substation automation and protection
  Monitoring, control and automation principles for power systems
  Protection principles for power systems
  Substation automation including also protection functions
  Substation automation structures and architectures
  Protection of generators, transformers, lines and busbars
  Communication for substation automation and protection
- Power system management and related communication
  Functions and management levels (network control)
  Communication in power systems (utility communication)

Methods
Lectures, demonstrations, audio-visuals.

Duration
5 days (until Friday noon)

CHP549
FOXMAN-EM
Network Management System

Course goal
This course provides a thorough and practical introduction to the FOXMAN-EM (Element Manager) and the FOXMAN-NV (Network View). After the successful completion of the course the participants will be familiar with the architecture, the options and the different functions of the FOXMAN-EM/NV. They will be able to configure the FOXMAN-EM/NV and to manage ABB supplied Network Elements.

Learning objectives
- Understand the FOXMAN-EM/NV features, architecture and options
- Explain how to setup and administer the system
- Configure the topological map and user interface
- Explain how to manage faults and maintain the system
- Configure FOXMAN-EM/NV to manage different types of Network Elements

Participants
Operation & maintenance personnel, system engineers, commissioning engineers, test engineers

Prerequisites
Attendance of equipment courses which have to be managed by the FOXMAN-EM

Topics
- Network Management Fundamentals
- FOXMAN-EM Features
- FOXMAN-NV Features
- System Setup and Administration
- Configuration Management
- Fault Management
- Working with Maps on the FOXMAN-NV

Methods
Lectures, demo and practical exercises

Duration
1 day

CHP552
FOX515H & Hs
Multiservice Utility-Multiplexer

Course goal
This course provides a thorough and practical introduction to the FOX515H and FOX515Hs products. After the successful completion of the course, the participants will be familiar with the features, applications and options of the FOX515H and the FOX515Hs. They will be able to configure and maintain both equipment in a network.
Communication Networks

Learning objectives
- Understand the FOX515H and FOX515Hs features, applications, architecture and options
- List the different options of accessing/managing the FOX515H and the FOX515Hs.
- Configure the FOX515H and the FOX515Hs
- Configure the PDH/Ethernet/SDH main features and interfaces
- Explain the maintenance and alarm/status reporting functions

Prerequisites
Good knowledge of analog and especially digital communications. Attendance of the course ‘Broadband Communication Networks’ (CHP520) and/or ‘Utility Communications - Fundamentals’ (CHP511) is strongly recommended.

Topics
- FOX505 Features and Applications
- System Architecture
- Equipment Configuration using FOXView
- Cross-connectivity
- SDH/PDH Applications
- Voice Applications
- Data Applications
- Synchronization
- Management Communication
- Maintenance

Methods
Lectures, demo and practical exercises

Duration
4 days

CHP554
FOXView Enterprise
Network Management System

Course goal
This course provides a thorough and practical introduction to the FOXView Enterprise Network Management System. After the successful completion of the course the participants will be familiar with the architecture, the options and the different functions of the FOXView. They will be able to configure the FOXView and to manage ABB supplied Network Elements.

Learning objectives
- Understand the FOXView features, architecture and options
- Explain how to setup and administer the system
- Configure the topological map and user interface
- Explain how to manage faults and maintain the system

Participants
Operation & maintenance personnel, system engineers, commissioning engineers, test engineers

Prerequisites
Good knowledge of IP, Ethernet switching and SDH. Attendance of the course ‘Ethernet Switching and TCP/IP - Introduction’ (CHP522) and/or ‘Broadband Communication Networks’ (CHP520) is recommended.

Topics
- FOX515H and FOX515Hs Features and Applications
- Equipment Architecture and Options
- SDH and E1 Connectivity
- Redundancy and Protection
- Ethernet / EoS including VLANs
- Equipment Configuration
- Maintenance

Methods
Lectures, demo and practical exercises

Duration
3 days

CHP553
FOX505 Access Multiplexer

Course goal
This course provides a thorough and practical introduction to the FOX505 as access multiplexer. After the successful completion of the course the participants will be familiar with the architecture and the most widely used interfaces and options of the FOX505. They will be able to configure and maintain the equipment in a network.

Learning objectives
- Understand the FOX505 features, applications, architecture and options
- List the different options of accessing/managing the FOX505
- Configure the FOX505 using the FOXView
- Configure the PDH/Ethernet/SDH main features and interfaces
- Explain the maintenance and alarm/status reporting functions

Participants
Operation & maintenance personnel, system engineers, commissioning engineers, test engineers

Prerequisites
Good knowledge of analog and especially digital communications. Attendance of the course ‘Broadband Communication Networks’ (CHP520) and/or ‘Utility Communications - Fundamentals’ (CHP511) is strongly recommended.

Topics
- FOX505 Features and Applications
- System Architecture
- Equipment Configuration using FOXView
- Cross-connectivity
- SDH/PDH Applications
- Voice Applications
- Data Applications
- Synchronization
- Management Communication
- Maintenance

Methods
Lectures, demo and practical exercises

Duration
4 days

ABB University Switzerland | Course Program 2014
CHP556
FOX660 Multiservice Utility Multiplexer

Course goal
This course provides a thorough and practical introduction to the FOX660 product. After the successful completion of the course, the participants will be familiar with the features, applications and options of the FOX660. They will be able to configure and maintain the equipment in a network.

Learning objectives
- Understand the FOX660 features, applications, architecture and options
- List the different options of accessing/managing the FOX660
- Configure the FOX660 using the FOXMAN-CT
- Configure the PDH/SDH main features and interfaces
- Configure the basic Ethernet features
- Explain the maintenance and alarm/status reporting functions

Participants
Operation & maintenance personnel, system engineers, commissioning engineers, test engineers

Prerequisites
Good knowledge of IP, Ethernet switching and SDH. Attendance of the course “Ethernet Switching and TCP/IP - Introduction” (CHP522) and/or “Broadband Communication Networks” (CHP520) is recommended.

Topics
- FOX660 Features and Applications
- Equipment Architecture and Options
- SDH and E1 Connectivity
- Redundancy and Protection
- Synchronization
- Basic Ethernet features
- Equipment Configuration with FOXMAN-CT
- Management Communication
- Maintenance

Methods
Lectures, demo and practical exercises

Duration
3 days

Additional 2 days are required for Advanced Ethernet Features (MPLS-TP, Circuit Emulation, Synchronous Ethernet, PTP IEEE 1588 and OTN)
Communication Networks

Prerequisites
Good knowledge of Ethernet, Switching, TCP/IP and IP Routing. Attendance of the course ‘Ethernet Switching and TCP/IP – Introduction’ (CHP522) is recommended. Good knowledge of AFS600 Switch Family Equipment or attendance of course ‘AFS600 Switch Family’ (CHP558) is required.

Topics
- AFF Features and Applications
- Equipment Architecture
- Equipment Configuration
- Maintenance

Methods
Lectures, demo and practical exercises

Duration
2 days

CHP560
AFF Firewall

Course goal
This course provides a thorough and practical introduction to the AFF Firewall. After the successful completion of the course, the participants will be familiar with the features, applications and options of the AFF Firewall. They will be able to configure and maintain the equipment in a network.

Learning objectives
- Understand the AFF features, applications, architecture
- Configure AFF for Port-Forwarding and Packet Filtering
- Configure AFF for Network Address Translation (NAT)
- Configure AFF for Virtual Private Networks (VPN)
- Explain the maintenance and alarm/status reporting functions

Participants
Operation & maintenance personnel, system engineers, commissioning engineers, test engineers

Prerequisites
Good knowledge of Ethernet, Switching, TCP/IP and IP Routing. Attendance of the course ‘Ethernet Switching and TCP/IP – Introduction’ (CHP522) is recommended. Good knowledge of AFS600 Switch Family Equipment or attendance of course ‘AFS600 Switch Family’ (CHP558) is required.

Topics
- AFR677 Features and Applications
- Equipment Architecture
- Equipment Configuration
- Maintenance

Methods
Lectures, demo and practical exercises

Duration
3 days
CHP568
ETL600 R3
Universal Digital PLC Equipment

Course goal
This course provides fundamental know-how of power line carrier technology and detailed information about the ETL600 Release 3. After the successful completion of this course, the participant will be familiar with the features and applications of the ETL600 R3 product and will be able to configure and maintain the equipment.

Learning objectives
- Understand the fundamentals of Power Line Carrier technology
- Understand the ETL600 R3 features, applications, architecture and options
- Configure the ETL600 R3 using the HMI600 software
- Configure analog, digital, LAN and Teleprotection services
- Change of RF Frequencies (incl. Filter Tuning)
- Test the equipment and measure the attenuation and return loss of power line
- Commissioning tests following check list
- Explain the maintenance and alarm/status reporting functions

Participants
Operation and maintenance personnel, system engineers, commissioning engineers, test engineers

Prerequisites
Good knowledge of Utility Communications

Topics
- Fundamentals of Power Line Carrier Technology
- ETL600 R3 Product Family: Features & Applications
- Equipment Architecture
- Equipment Configuration with the HMI600 Software
- Analog Services
- Digital Services
- LAN Applications
- Teleprotection Applications and Testing
- RF Filter tuning
- Commissioning, Tests and Maintenance

Methods
Lectures, demo and practical exercises

Duration
5 days

CHP569
ETL600 R4
for Experienced ETL600 R3 Users

Course goal
This course provides a thorough and practical introduction to new features and modules of the ETL600 Release 4 compared to Release 3. After the successful completion of this course, the participant will be familiar with the new functions and applications of the ETL600 R4 product and will be able to configure and maintain the equipment.

Learning objectives
- Understand the ETL600 R4 features, applications, architecture and options
- Configure the new modules of ETL600 R4 using the HMI600 software
- Configure new LAN services and digital transit of speech channels
- Tuning of Tx-Filters
- Testing of new functions

Participants
Operation and maintenance personnel, system engineers, commissioning engineers, test engineers

Prerequisites
Good knowledge of ETL600 R3 Universal Digital PLC Equipment or attendance of course ‘ETL600 R3 Universal Digital PLC Equipment’ (CHP568) is required.
Good knowledge of IP and Ethernet switching. Attendance of the course ‘Ethernet Switching and TCP/IP - Introduction’ (CHP522) is recommended.

Topics
- ETL600 R4 Product Family: Features & Applications
- ETL600 R4 Equipment Architecture
- ETL600 R4 Equipment Configuration with the HMI600 Software
- Tx-Filter Tuning
- Digital Transit of compressed telephony channels
- New LAN Features
- Test

Methods
Lectures, demo and practical exercises

Duration
2 days
### CHP570
**ETL600 R4**
**Universal Digital PLC Equipment**

**Course goal**
This course provides fundamental know-how of power line carrier technology and detailed information about the ETL600 Release 4. After the successful completion of this course, the participant will be familiar with the features and applications of the ETL600 R4 product and will be able to configure and maintain the equipment.

**Learning objectives**
- Understand the fundamentals of Power Line Carrier technology
- Understand the ETL600 R4 features, applications, architecture and options
- Configure the ETL600 R4 using the HMI600 software
- Configure analog, digital, LAN and Teleprotection services
- Change of RF Frequencies (incl. Filter Tuning)
- Test the equipment and measure the attenuation and return loss of power line
- Commissioning tests following check list
- Explain the maintenance and alarm/status reporting functions

**Participants**
Operation and maintenance personnel, system engineers, commissioning engineers, test engineers

**Prerequisites**
Good knowledge of Utility Communications
Good knowledge of IP and Ethernet switching. Attendance of the course ‘Ethernet Switching and TCP/IP - Introduction’ (CHP522) is recommended.

**Topics**
- Fundamentals of Power Line Carrier Technology
- ETL600 R4 Product Family: Features & Applications
- Equipment Architecture
- Equipment Configuration with the HMI600 Software
- Analog Services
- Digital Services
- LAN Applications
- Teleprotection Applications and Testing
- RF Filter tuning
- Commissioning, Tests and Maintenance

**Methods**
Lectures, demo and practical exercises

**Duration**
5 days

### CHP574
**NSD570 Teleprotection Equipment**

**Course goal**
This course provides fundamental know-how of Teleprotection technology and detailed information about the NSD570. After the successful completion of this course, the participant will be familiar with the features and applications of the NSD570 and will be able to configure and maintain the equipment.

**Learning objectives**
- Understand the fundamentals of Teleprotection
- Understand the NSD570 features, applications, architecture and options
- Configure the NSD570 using the HMI570 software
- Configure the main parameters and line interfaces
- Test the equipment
- Explain the maintenance and alarm/status reporting functions

**Participants**
Operation & maintenance personnel, system engineers, commissioning engineers, test engineers

**Prerequisites**
Good knowledge of Utility Communications. Experience with relay protection is an advantage.

**Topics**
- Teleprotection Fundamentals: Distance Line Protection, Breaker Failure Protection, Transformer protection
- NSD570 - Features and Applications
- Equipment Architecture and Interfaces
- Equipment Setup and Programming
- HMI570 Configuration Software
- Equipment Test and Maintenance

**Method**
Lectures, demo and practical exercises

**Duration**
2.5 days
Additional half day is required for detailed information and practical exercises on GOOSE Protection Relay Interface G3LS.

### CHP580
**ARxxx SCADA Radio Modem Family**

**Course goal**
This course provides a thorough and practical introduction to the ARxxx SCADA Radio Modem Family. It provides also a theoretical introduction to wireless communication for SCADA Radio Modems. After the successful completion of the course, the participants will be familiar with the features, applications and options of the ARxx equipment Family. They will be able to configure and maintain the equipment in a network.
Prerequisites
Good knowledge of IP, Ethernet, switching and routing. Attendance of the course ‘Ethernet Switching and TCP/IP – Introduction’ (CHP522) is recommended.
Good knowledge of Wireless Communication. Attendance of the course ‘Wireless Communication - Introduction’ (CHP523) is recommended.

Topics
- Tropos Portfolio
- System and Product Features, Applications, Architecture and Options
- Overall System Working
- Deployment Planning
- Equipment Configuration
- System Management
- Test and Maintenance

Methods
Lectures, demo and practical exercises

Duration
4 days

CHP586
iS3000 SIP@NET Telephone System

Course goal
This course gives a thorough and practical introduction to the iS3000 SIP@NET Series PABX. The main focus is on the iS3000-19L (with the latest technology), which is also the hardware platform for the practical exercises. After the successful completion of the course the participant will be familiar with the features, applications and the most widely used options of the iS3000 series. He/she will understand the internal numbering scheme and the subscriber line settings and will be able to actually modify/program these features on the exchange. The participant will also understand the essentials of iS3000 SIP@NET trunk connections and will be able to read out the respective configuration data from the exchange.

Learning objectives
- Understand the fundamentals of telephony in utility communication systems
- Understand the Hybrid iS3000 features, applications, architecture and options
- Explain the numbering schemes and different facilities
- Configure the iS3000 using the SMPC Software
- Read the trunk configuration parameters
- Explain the administrative maintenance functions

Participants
Operation & maintenance personnel, system engineers, commissioning engineers, test engineers

Prerequisites
Good knowledge of Utility Communications

Topics
- SCADA Radios in Utility Communications Systems
- SCADA Wireless Communication
- Equipment Architecture and Interfaces
- Equipment Setup and Programming
- Configuration Software
- Equipment Test and Maintenance

Method
Lectures, demo and practical exercises

Duration
3 days

CHP582
Tropos Wireless Mesh Networks

Course goal
This course provides a thorough and practical introduction to Tropos Wireless Mesh Networks. After the successful completion of the course, the participants will be familiar with the equipment, features, applications and options of the Tropos product portfolio. They will be able to configure and maintain the equipment used in a typical Tropos Wireless Mesh Networks.

Learning objectives
- Understand the different equipment available in this portfolio
- Understand the features, applications, architecture and options of a typical Tropos Wireless Mesh Networks
- Understand how the overall system works
- Learn how to plan the deployment of the system
- Configure the equipment
- Learn how to use the Network Management System
- Explain the maintenance and alarm/status reporting functions

Participants
Operation & maintenance personnel, system engineers, commissioning engineers, test engineers

Prerequisites
Good knowledge of SCADA Wireless Communication

Methods
Lectures, demo and practical exercises

Duration
3 days
Communication Networks

Topics
- Telephony in Utility Communication Systems
- iS3000 SIP@NET Features and Applications:
  Analog and Digital Subscriber Lines
  Analog and Digital Trunk Lines
- Equipment Architecture
- Configuration with SMPC Software
- Numbering Schemes
- Facilities
- Administrative maintenance
- Reading of Trunk Configuration parameters
- Overview of Telephony Solutions

Method
Lectures, Demo and Practical Exercises

Duration
5 days

For Operation & maintenance personnel, it is recommended after the participation on this training to attend the course ‘iS3000 SIP@NET Trunk Routing and Advanced Features’ (CHP587)

CHP587
iS3000 SIP@NET Trunk Routing and Advanced Features

Course goal
This course is based on the iS3000 SIP@NET Telephone System course and provides in-depth information on trunk lines and introduces advanced features like VoIP (Voice over IP) and DECT (Digital Enhanced Cordless Telephony). After the successful completion of the course the participant will understand analog and digital trunk lines on the iS3000 SIP@NET and will be able to actually program routes for trunk connections. The participants will understand the essentials of VoIP and DECT and know how these technologies can be used on the iS3000 SIP@NET.

Learning objectives
- Explain the available types of trunks and their protocols in details
- Understand the iS3000 Network Design
- Configure analog/digital trunk lines
- Read the trunk configuration parameters
- List different types of advanced features used on the iS3000 SIP@NET

Participants
Operation & maintenance personnel, system engineers, commissioning engineers, test engineers

Prerequisites
Attendance of course ‘iS3000 SIP@NET Telephone System’ (CHP586) is required.
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## CHP595
**FOX615 Utility Grade Universal Access/Transport Multiplexer**

**Course goal**
This course provides a thorough and practical introduction to the FOX615 as access and transport multiplexer. After the successful completion of the course the participants will be familiar with the architecture and the most widely used interfaces and options of the FOX615. They will be able to configure and maintain the equipment in a network.

**Learning objectives**
- Understand the FOX615 features, applications, architecture and options
- List the different options of accessing/managing the FOX615
- Configure the FOX615 using the FOXCST Software
- Configure the PDH/Ethernet/SDH main features and interfaces
- Explain the maintenance and alarm/status reporting functions

**Participants**
Operation & maintenance personnel, system engineers, commissioning engineers, test engineers

**Prerequisites**
Good knowledge of analog and especially digital communications. Attendance of the course ‘Broadband Communication Networks’ (CHP520) and/or ‘Utility Communications - Fundamentals’ (CHP511) is strongly recommended.

**Topics**
- FOX615 Features and Applications
- System Architecture
- Equipment Configuration using FOXCST Software
- Cross-connectivity
- SDH/PDH Applications
- Voice Applications
- Data Applications
- Teleprotection Application
- Synchronization
- Management Communication

**Methods**
Lectures, demo and practical exercises

**Duration**
5 days

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## CHP593
**FOXMAN-UN Network Management System**

**Course goal**
This course provides a thorough and practical introduction to the FOXMAN-UN Network Management System. After the successful completion of the course the participants will be familiar with the architecture and the different functions of the FOXMAN-UN. They will be able to configure the FOXMAN-UN and to manage ABB supplied Network Elements.

**Learning objectives**
- Understand the FOXMAN-UN features, architecture and options
- Explain how to setup and administer the system
- Configure the system
- Explain how to manage faults and maintain the system
- Explain the system installation and how to use the networking package

**Participants**
Operation & maintenance personnel, system engineers, commissioning engineers, test engineers

**Prerequisites**
Attendance of equipment courses which have to be managed by the FOXMAN-UN.

**Topics**
- FOXMAN-UN Architecture
- Key Features
- System Setup and Administration
- Configuration Management
- Fault Management
- Performance Management
- Networking Package
- System Installation

**Methods**
Lectures, demo and practical exercises

**Duration**
3 days
 COURSE GOAL
This course provides a thorough and practical introduction to the FOX615 as access and transport multiplexer. After the successful completion of the course the participants will be familiar with the architecture, the Ethernet enhanced features and the most widely used interfaces and options of the FOX615. They will be able to configure and maintain the equipment in a network. Furthermore they will be able to troubleshoot and commission the FOX615. Finally they will be able to integrate the FOX615 in an existing FOX Family product network.

LEARNING OBJECTIVES
- Understand the FOX615 features, applications, architecture and options
- List the different options of accessing/managing the FOX615
- Configure the FOX615 using the FOXCST Software
- Configure the PDH/Ethernet/SDH main features and interfaces
- Configure Ethernet enhanced features
- Explain the maintenance and alarm/status reporting functions
- Understand how to troubleshoot and maintain the FOX615
- Understand how to commission and test the FOX615
- Understand how to integrate the FOX615 in an existing FOX Family product network

PARTICIPANTS
Operation & maintenance personnel, commissioning engineers

PREREQUISITES
High knowledge and practical experiences on the FOX515 equipment
Good knowledge of IP and Ethernet switching. Attendance of the course ‘Ethernet Switching and TCP/IP - Introduction’ (CHP522) is recommended.

TOPICS
- FOX615 Features and Applications
- System Architecture
- Equipment Configuration using FOXCST Software
- Cross-connectivity
- SDH/PDH Applications
- Ethernet Enhanced Features
- Voice Applications
- Data Applications
- Teleprotection Application
- Synchronization
- Management Communication
- Troubleshooting
- Maintenance
- Commissioning
- Integration to existing FOX Family product network

METHODS
Lectures, demo and practical exercises

DURATION
5 days