ABB University Switzerland
Course Program 2014
Part 4 – Power Generation
ABB University Switzerland

ABB Switzerland Ltd
LC Power Generation
Bruggerstrasse 72
CH-5400 Baden
Phone +41 58 585 65 53
Fax +41 58 585 28 00

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

<table>
<thead>
<tr>
<th>No.</th>
<th>days/remarks</th>
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### Power Generation

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<th>Basic Courses</th>
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<tr>
<td>Power Plant Fundamentals – Layout and Components</td>
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<tr>
<td>Power Plant Process (Basic)</td>
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<tr>
<td>Power Plant Process (Waste-to-Energy)</td>
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<tr>
<td>Power Plant Process (Combined Cycle Power Plant)</td>
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### Product Courses

| System 800xA / Training for Operators | CHP441 | 1 | on request |
| System 800xA for Advant Master with APC AC450 | CHT520 | Mon - Fri |
| System 800xA for AC100 | CHP411 | 5 | on request |
| System 800xA for Procontrol P13/42 | CHP431 | 5 | on request |
| System 800xA Basic Configuration with AC800M | CHT314 | 5 | on request |
| System 800xA with AC 800M Engineering, Part 1 – Function Designer | CHT315F | Mon - Fri |
| System 800xA with AC 800M Engineering, Part 2 – Human System Interface | CHT315H | Mon - Fri |
| Advant Controller 400 with S800, Configuration and Operation | CHA531 | 5 | on request |
| Advant Station 500/800, Configuration and Operation | CHA531 | 5 | on request |
| Advant Controller 100, Configuration and Operation | CHP415 | 3 | on request |
| Advant Power Control (APC) (Basic Course) | CHP418 | 2 | on request |
| Advant Power Control (APC), Graphic creating for AS 5000S, Basic Course | CHP419 | 1 | on request |
| Advant Enterprise Historian, Configuration and Operation | CHP430 | 3 | on request |
| Advant Controller 400 and Advant Station 500 GS, Maintenance | CHA450 | 3 | on request |
| Advant Power Control Expert Training | CHP411 | 10 | on request |
| TURBOCTRL Application and Maintenance | CHP412 | 5 | on request |
| PGW with System 800xA Basic Course | CHP420 | 3 | Mon-Thu |
| PGW with System 800xA Advanced Course | CHP421 | 2 | on request |
| Procontrol P13/42 Basics and Application | CHP433 | 5 | on request |
| Progress 5 Basics and Application | CHP434 | 4 | Mon - Thu |
| EDS P3 Engineering and Service Tool | CHP435 | 4 | on request |

Course language: German or English depending on participants needs (course documentation in English only).

Legend: 
- **E** = public holiday
- **LC** = LC Power Generation, Baden

The latest version of our course schedule can be found on Internet: www.abb.ch/abbuniversity
## Power Generation

### Course Selection Table

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<td>Power Plant Process (Combined Cycle Power Plant)</td>
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<td>System 800xA for AC100</td>
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<td>System 800xA Basic Configuration with AC800M</td>
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<td>Advant Controller 400 with S800, Configuration and Operation</td>
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<td>Advant Station 500 OS, Configuration and Operation</td>
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<td>TURBOTROL Application and Maintenance</td>
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<td>PGIM with System 800xA Advanced Course</td>
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<td>Procontrol P13/42 Basics and Application</td>
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<td>EDS P3 Engineering and Service Tool</td>
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<td>CHP510</td>
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Further Training (tailor-made Seminars, Special Courses, Project Courses, ABB internal Courses and Lectures) on all above and other topics, products and systems can be arranged on request.
# ABB University Switzerland

## Enrolment form

**Personal details**

Title / Job function

First name

Surname

Phone / Mobile

E-mail

**Course details**

<table>
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<th>Course number</th>
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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 address</th>
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For ABB companies only  
(Please check with your financial department)

CIT (eg, CHPAU)  PG (eg, 2875)

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

To  
ABB University Switzerland Administration  
Bruggerstrasse 72  
CH-5400 Baden/Switzerland  
Fax:  +41 58 585 28 00  
Phone:  +41 58 585 67 34  
E-mail: university@ch.abb.com
Power Generation

CHP400
Power Plant Fundamentals – Layout and Components

Course goal
The course goal is to give students fundamental knowledge of Power Generation Technology and an overview of functionality and operation of the main components.

Learning objectives
- Describe the layout of a specific power plant
- Identify the main components and describe their characteristics
- Outline operation and installation of components
- Describe main plant operation steps and maintenance measures
- Describe function of related Power Generation System

Participants
Supervisors, design and planning personnel, engineering and application personnel, maintenance and operating personnel and consultants from the Electricity Supply Industry. Sales and technical personnel from ABB companies.

Prerequisites
Electrical or mechanical engineering degree, technical college qualifications or equivalent. Basic knowledge of power generation and process control is recommended.

Topics
POWER PLANT TURBOMACHINES
- Fundamentals: Design, classification, physical concepts and basic laws.
- Hydraulic machines: Application, function and operation of turbines and pumps.
- Turbocompressors: Construction, principles, operation range and protection.
- Gas- and Steamturbines: Function and classification, principles, starting steps and operation modes.

TURBOGROUP DESIGN AND INSTALLATION
- Turbomachines installation: General projects, classification. Identification of main components.
- Generator and exciter machines: Basic performance of a turbogenerator. Static and brushless excitation.
- Fixed components: Casing, assembling and fixation. Fixed points and expansion control.
- Rotating components: Design, adjustments and basic measurements. Sealing, axial and radial bearings.
- Alignment: Different couplings and shaft line in operation. Machine and rotor alignment.

PROCESS SYSTEM DESCRIPTION
- Power plant visit: Visit of a selected Power plant. Identification components, reviewing design aspects.
- Process systems: Documentation (P & ID’s, SLD’s, Instructions), classification.
- Primary systems: Flow path, start-up and operation modes of oil systems.
- Secondary systems: Cooling, sealing & blow off systems, function and operation modes.
- Steam water cycle: Design of Boilers and HRSG’s, steam process systems, flow path and basic function
- BOP systems: Selection of BOP systems e.g. closed cooling water, etc.
- CCPP process cycle

START-UP AND OPERATION MODES OF A CCPP, CONTROL SYSTEM
- Gasturbine Process: Design of open and closed loop controllers. Actual regulators, speed and load control, function diagrams.
- Startup sequence: Preparation, standstill checks, start-up, and ignition. Check points. Synchronizing & loading characteristics.
- Typical starting failures: Problems during start-up. Troubleshooting sequence and solutions.
- Operation modes: CCPP, including HRSG and steamturboset, considering power output and network condition.
- Gasturbine Protection: Drive and group control, hardwired units for supervision and protections.
- Shutdown sequence: Normal shutdown with deloading gradient, idling and rundown. Emergency shutdown.
- Control System: Introduction to Automation Platform and philosophy. Design example.

MAINTENANCE AND TROUBLE-SHOOTING (optional)
- Output and efficiency: Calculation of power output and efficiency of a CCPP, influence factors.
- Important contaminants: Possibilities of fouling of compressors and turbines, Blade Corrosion.

Methods
Lectures, demonstrations, applied exercises, discussions and a plant visit.

Duration
4 days (5 days incl. chapter “Maintenance and Troubleshooting”)
Power Generation

CHP401
Power Plant Process (Basics)

Course goal
The participants acquire fundamental knowledge of Power Plant Process and an overview of functionality and operation of the main components.

Learning objectives
- Describe the layout of a Power Plant
- Identify the main components
- Describe main plant operation steps

Participants
Sales and technical personnel

Prerequisites
Engineering degree, technical college qualifications or equivalent. Basic knowledge of power generation and process control is recommended.

Topics
- Process Overview
- Design, operation and application of thermal turbomachines
- Basic process for construction and operation of power plants
- Gas- and steamturbines with generators for industrial and power generation applications
- Thermodynamic principle

Methods
Lectures, demonstrations, exercises and discussions.

Duration
1 day

CHP403
Power Plant Process (Combined Cycle Power Plant)

Course goal
The course goal is to give students fundamental knowledge of Combined Cycle Power Plant Process and an overview of functionality and operation of the main components.

Learning objectives
- Describe different types of power plants and layouts
- Component involved in the CCPP and the functionality of the major components
- Understand system dependencies
- Overview and the procedure involved in starting the combined cycle gas turbine plant
- Key performance indicators of the plant

Participants
Sales and technical personnel

Prerequisites
Engineering degree, technical college qualifications or equivalent. Recommended course: CHP401

Topics
- Open Cycle and Combined Cycle Gas Turbine Plants (Brayton and Rankine Cycle)
- Different Combined Cycle Power Plants (CCPP, ICCP)
- Process overview and main components as gas turbine, HRSG, water steam circuit, steam turbine
- Gas turbine start-up pre-requisites
- Gas turbine start-up steps up to 3000 rpm
- Gas turbine load operation, process behaviour of HRSG and water steam circuit during gas turbine load operation (condenser vacuum pulling, steam bypass operation etc.)
- Gas turbine operation concept
- Start-up pre-requisites for steam turbine rolling
- Steam turbine cold start exercise on the simulator
- CCP Operation and dynamic behaviour

CHP402
Power Plant Process (Waste-to-Energy)

Course goal
The participants acquire fundamental knowledge of Waste-to-Energy plants (WtE).

Learning objectives
- Explain the process of a Waste-to Energy plant
- Understand the basic subject principles
- Understand the operation of a Waste-to Energy plant
- Identify the use and the basic functions of the production facilities

Participants
Sales and technical personnel

Prerequisites
Engineering degree, technical college qualifications or equivalent. Recommended course: CHP401
Power Generation

**Methods**
Lectures, demonstrations, exercises on simulator

**Duration**
2 days

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**CHT320**
System 800xA for Advant Master with APC AC450

**Course goal**
The goal of this course is to learn the installation, configuration and maintenance of the Extended Automation System 800xA for Advant Master AC450 with APC in the field of Power Generation Applications.

**Learning objectives**
- Plan an appropriate architecture for a system 800xA with Advant Master
- Install the AC400 Connect and APC software
- Navigate in the system and create new objects / aspects
- Configure and maintain the communication between 800xA and Advant Controllers
- Configure and modify graphic displays, faceplates and graphic elements
- Manage and configure alarm and events
- Configure historical data collection and trends
- Configure time synchronization
- Create and customize a workplace
- Configure user accounts and describe how access rights work
- Save and restore data

**Participants**
Operators.

**Prerequisites**
Students should have attended the AC400 configuration course CHA331 or have knowledge and experience associated with the content of the course.

**Topics**
- System 800x architecture for Advant Master
- AC400 Connect and APC installation
- Plant Explorer introduction
- Controller communication and Database integration
- Graphic Displays and Faceplates
- Alarm and Events
- Historical data collection and Trends
- Time synchronization
- Workplace configuration
- Security
- Backup and restore

**Methods**
Lectures, practical exercises and demonstrations

**Duration**
5 days

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**CHP441**
System 800xA / Training for Operators

**Course goal**
The course goal is to teach students how to apply the System 800xA in relation to CC and GT Power Plant Control Operation.

**Learning objectives**
- Describe architecture, configuration and functionality of system
- Outline control and communication functions
- Utilize and apply operator facilities
- Interpret messages, on the process displays and in the alarm-, event- and the system list.

**Participants**
Operators.

**Prerequisites**
Knowledge on automation and control (open and closed loop control)
Basic knowledge GT and CC process.

**Topics**
- System overview: components, communication concept, interfaces
- Screen layout
- Screen navigation, using different display types
- Process display, alarms, events, logs and trends
- System status, system messages
- Faceplates for drives, selectors, group controls and analog controllers
- Object control: Manual, Auto, etc.
- Alarm- and Eventlist handling
- Historical data collection and trends

**Methods**
Lectures, demonstrations, practical exercises.

**Duration**
1 day
# Power Generation

## CHP417
### System 800xA for AC100

**Course goal**
The course goal is to teach the students how to install, configure and operate the Extended Automation System 800xA for AC100 with the AC160 controller in the field of Power Generation Applications.

**Learning objectives**
- Describe architecture and basic configuration of system
- Follow the setup of displays and faceplates, navigate within different views, structures and layouts
- Handle displays and faceplates, trends, event and alarm lists
- Start and configure system
- Setup events, alarms and trends
- Backup and restore the system
- Outline security aspects, handle security requirements and national language support
- Handle Visual Basic Graphics Builder and draw new displays from scratch

**Participants**
System engineers, operators as well as commissioning and maintenance personnel

**Prerequisites**
Basic knowledge of automation and computer technology, particularly Windows XP
Fundamentals of 800xA, Knowledge of AC160

**Topics**
- Network Definitions, Plant Layout, Server/Client, Aspect Server, Connectivity Server
- Different Workplaces, Display Navigation, Standard Displays
- Process Objects, Faceplates
- Event and Alarm Handling, Process Sections, Trends Handling, Status List, System Status Viewer
- Navigation, Search Tool, Tooltip and on-line help, Help and Documentation
- Installation of System 800xA, patches and all needed Software
- Connection to AF100
- Export, Import, Backup and Restore
- Security, Users and NLS (National Language Support)

**Methods**
Lectures, practical exercises and demonstrations

**Duration**
5 days

## CHP431
### System 800xA for Procontrol P13/42

**Course goal**
The course goal is to teach the students how to install, configure and operate the Extended Automation System 800xA in the field of Power Generation applications, based on Procontrol P13/42.

**Learning objectives**
- Describe architecture and basic configuration of system
- Follow the setup of displays and faceplates, navigate within different views, structures and layouts
- Handle displays and faceplates, trends, event and alarm lists
- Start and configure the system
- Setup events, alarms and trends
- Backup and restore the system
- Outline security aspects, handle security requirements and national language support
- Handle Visual Basic Graphics Builder and draw new displays from scratch

**Participants**
System engineers, operators as well as commissioning and maintenance personnel

**Prerequisites**
Basic knowledge of automation and computer technology, particularly Windows XP
Knowledge of Procontrol P13/42

**Topics**
- Network Definitions, Plant Layout, Server/Client, Aspect Server, Connectivity Server
- Different Workplaces, Display Navigation, Standard Displays
- Process Objects, Faceplates
- Event and Alarm Handling, Trends Handling, Status List, System Status Viewer
- Navigation, Search Tool, Tooltip and on-line help, Help and Documentation
- Installation of Process Portal A, patches and all needed Software
- Connection to AF100
- Export, Import, Backup and Restore
- Security, Users and NLS (National Language Support)
- Static Graphic Library, Power Operator Workplace

**Methods**
Lectures, practical exercises and demonstrations

**Duration**
5 days
**Power Generation**

**CHT314**  
**System 800xA Basic Configuration with AC800M**

**Course goal**  
The goal of this course is to learn the basic configuration of the Extended Automation System 800xA in the field of Power Generation Applications.

**Learning objectives**  
- Explain the System 800xA architecture and the function of the different components  
- Modify existing application programs by using Function Block Diagrams, Sequential Function Charts, Structured Text and Control Modules  
- Navigate in the system and create new objects / aspects  
- Describe the structure of application programs i.e. variables, libraries, programs, tasks  
- Troubleshoot the OPC connectivity to AC800M  
- Configure the AC 800M hardware and corresponding I/O’s  
- Load the controller and work in online mode  
- Modify graphic displays  
- Manage and configure alarm and events  
- Monitor trends and configure historical data collection  
- Import / export System 800xA data

**Participants**  
This training is targeted to System 800xA users who need to learn the fundamentals in order to form a foundation for maintenance and administration skills. If more comprehensive engineering skills are needed, it is recommended to consider CHT315 instead.

**Prerequisites**  
Students shall know the fundamentals of working with Control Systems and have basic knowledge of Windows XP.

**Topics**  
- System 800xA architecture  
- Engineering and Operator Workplace  
- Application structures  
- AC 800M Hardware and OPC connectivity  
- Applications with Function Block Diagram (FBD), Structured Text (ST) and Control Modules (CM)  
- Sequential Function Chart (SFC)  
- Alarm and Events  
- Historian and Trends  
- Graphic Displays  
- Operator Workplace  
- Function Designer  
- Import / export

**Methods**  
Lectures, practical exercises and demonstrations

**Duration**  
5 days

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**CHT315F**  
**System 800xA with AC 800M Engineering, Part 1 – Function Designer**

**Course goal**  
The goal of this course is to learn the engineering of a complete control project using the Extended Automation System 800xA with AC 800M controllers and Function Designer as the engineering tool. Note that this course is split in two parts and the follow-up course is CHT315H for the Human System Interface (HSI) configuration.

**Learning objectives**  
- Explain the System 800xA architecture and the function of the different components  
- Navigate in the system and create new objects  
- Create a new control project and plan the structure of application programs based on a P&ID and a Functional Specification  
- Configure the AC 800M hardware and corresponding I/O’s  
- Setup the OPC connectivity to AC800M  
- Analyze the controller diagnostics and optimize the CPU load / memory usage  
- Create function diagram, allocate them and generate the controller code  
- Display and change values in online mode  
- Analyze the work methodology using project specific templates  
- Generate the MMS cross communication and describe the communication for various protocols  
- Create simple sequences using SPL  
- Parameterize signal objects and allocate them

**Participants**  
This training is targeted to system and application engineers, commissioning and maintenance personnel, service engineers and system integrators.

**Prerequisites**  
Students shall know the fundamentals of working with Control Systems and have basic knowledge of Windows XP and networking technologies.

**Topics**  
- System 800xA architecture  
- Engineering Workplace / Plant Explorer  
- Project and application structures  
- AC 800M hardware  
- Project backup  
- Libraries  
- OPC connectivity  
- Task assignment and memory  
- Variables and data types  
- Function Designer concepts  
- Engineering with Function Designer  
- Function Designer templates  
- Sequential Programming Language (SPL)  
- Communication  
- User defined object types (optional)
Power Generation

Methods
This is an instructor led course with interactive classroom discussions and associated lab exercises. Approximately 50% of the course is hands-on lab activities.

Duration
5 days

CHT315H
System 800xA with AC 800M Engineering, Part 2 – Human System Interface

Course goal
The goal of this course is to learn the engineering of a complete control project using the Extended Automation System 800xA with AC 800M controllers and Control Builder as the engineering tool. Note that this course is split in two parts and the pre-course is CHT315F.

Learning objectives
– Build up a plant model in the Functional and Location Structure
– Configure process graphic displays and define navigation links
– Modify faceplates and create graphic elements
– Manage and configure alarm and events
– Configure external alarms and alarm printers
– Set up the historical data collection and configure trend displays
– Create and customize Operator Workplaces
– Configure user accounts and describe how access rights work
– Backup and restore System 800xA data
– Use the import / export tool
– Create simple reports using MS Excel Data Access
– Use bulk data handling with templates
– Describe the NLS principles

Participants
This training is targeted to system and application engineers, commissioning and maintenance personnel, service engineers and system integrators.

Prerequisites
Students should have attended the course CHT315F “Engineering with Function Designer” or have knowledge and experience associated with the content of these courses.

Topics
– Plant modelling
– Graphic displays
– Graphic elements
– Faceplates
– Alarm and events
– Historical data collection
– Trend displays
– Operator Workplace
– User security
– Backup and restore

CHA331
Advant Controller 400 with S800, Configuration and Operation

Course goal
The course goal is to teach students how to configure and operate Advant Controller 400 Series with remote S800 I/O in relation to CC and GT Power Generation Applications.

Learning objectives
– Upon completion of this course, students will be able to program Advant Controller 400 using Advant Station 100 Series Engineering Stations

Participants
System, process and application engineers. Maintenance, service and commissioning engineers.

Prerequisites
Basic knowledge of logic diagrams, process control and MS Windows

Topics
– AMPL programming methods
– How to define, dimension and populate a data base
– AdvaBuild Function Chart Builder and On-line Builder software: PC and DB Configuration, Dumping and loading, Testing, Documentation

Methods
Lectures, demonstrations, practical exercises.

Duration
5 days
CHA351
Advant Station 500 OS, Configuration and Operation

Course goal
The course goal is to teach students how to configure and operate the Advant Station 500 OS in relation to CC and GT Power applications.

Learning objectives
- Configure system applications using available tools
- Operate the Advant Station 500 OS

Participants
System-, process- and application engineers. Operators, maintenance, service and commissioning engineers.

Prerequisites
General knowledge of Automation Systems. Knowledge corresponding to course CHA331.

Topics
- User interface
- Operator functions
- On-line Builder
- Basics in display design
- Event and alarm
- Process sectioning and authority control
- Status list
- Logging and trend presentation
- System status
- Different backup possibilities
- Printer handling

Methods
Lectures, demonstrations, practical exercises.

Duration
2 days

CHP418
Advant Power Control (APC) for AC 450 Basic Course

Course goal
The course goal is to teach students how to use the functionality of Advant Power Control (APC) for Advant Controller AC 450 in the field of Plant Automation Applications.

Learning objectives
Upon completion of this course, students can describe the functionality and applications of Plant Control functions and their documentation, and will be able to perform minor modifications.

Participants
System, process and application engineers. Maintenance, service and commissioning engineers.

Prerequisites
Knowledge corresponding to course CHA331 and CHA351.

Topics
- Realization of Plant Control Functions by “Functional Units” and “Type Circuits”
- Functionality of Advant Power Control functions (APC)
- Plant specific user surface at the Operator Station
- Modifying and creating functions via FCB
- Documentation of FUs with reading exercises
- Small engineering exercises

Methods
Lectures, demonstrations, practical exercises.

Duration
2 days
Power Generation

CHP419
Advant Power Control (APC), Graphics creating for AS 500OS, Basic Course

Course goal
The course goal is to teach students how to maintain process displays and special APC Functions at Operator Station AS 500OS in relation to CC and GT Power Plant Automation Applications.

Learning objectives
- create / modify / install process displays including call-up
- handle the APC Authority System
- handle special APC lists and signal simulation

Participants
System, process, and application engineers. Operators, maintenance, service and commissioning engineers.

Prerequisites
Knowledge corresponding to course CHA331 and CHA351.

Topics
- Advant control platform for power plants using the components for the Advant Enterprise Historian
- System configuration such as creation and deletion of an Advant Enterprise Historian node
- Communication of the Advant Enterprise Historian with other nodes
- Creation of additional operator station functions in the Advant Enterprise Historian such as expanded event logs and trends for power plant applications
- Creation of numerical logs
- Creation of balance reports, maintenance reports and snapshot reports
- Post-trip analysis
- Archiving function
- Balance reports
- Screen layout for power plant applications
- Secondary functions for the display on operator stations such as event logs and trends

Methods
Lectures, demonstrations, practical exercises.

Duration
3 days

CHP430
Advant Enterprise Historian, Configuration and Operation

Course goal
The course goal is to teach students how to configure and operate Advant Enterprise Historian in relation to CC and GT Power Plant Control Applications.

Learning objectives
- create event lists, trend displays and numerical logs
- create reports and post-trip logs
- operate Advant Enterprise Historian
- interpret and handle displays

Participants
System, process and application engineers. Operators, maintenance, service and commissioning engineers.

Prerequisites
Knowledge corresponding to course CHA331 and CHA351.

Topics
- Create event lists, trend displays and numerical logs
- Create reports and post-trip logs
- Operate Advant Enterprise Historian
- Interpret and handle displays

Methods
Lectures, demonstrations, practical exercises.

Duration
1 day

CHA240
Advant Controller 400 and Advant Station 500 OS, Maintenance

Course goal
The course goal is to teach students how to maintain process displays and special APC Functions at Operator Station AS 500OS in relation to CC and GT Power Plant Automation Applications.

Learning objectives
- Find functional information for the system using available, standard documentation
- Handle Advant Controller 400
- Handle Advant Station 500 OS
- Interpret common system messages
- Replace auxiliary units in Advant Station 500 OS
- Find and replace faulty units in an Advant Controller 400
- Expand an Advant Controller 400 with new units

Participants
Maintenance, service and commissioning engineers.

Prerequisites
Process knowledge, knowledge corresponding to the course CHA331 and CHA351.
Power Generation

**Topics**
- The different parts of the system and their interaction
- Use of the manuals and other standard documentation
- Advant Controller 400 I/O and the central functions
- Advant Controller 400 I/O expansion
- Advant Station 500 OS, service functions
- Communication hardware
- Fault finding techniques

**Methods**
Lectures, demonstrations, practical exercises.

**Duration**
3 days

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**CHP411**

Advant Power Control System Expert Training

**Course goal**
The participants acquire in-depth knowledge about the Advant Control System with APC for combined cycle power plant based on Egaterol 8 and Turbotrol 8

**Learning objectives**
- Monitor and analyze the data flow from the I/Os to the HSI and the AEH/IMS
- Handle and utilize the programming tools for AC160 and AC450
- Apply Unix commands
- Troubleshoot the AS500OS; AEH/IMS and the Advant controllers
- Analyze and configure alarm and events
- Backup and restore

**Participants**
Maintenance, service and application engineers.

**Prerequisites**
Knowledge corresponding to courses CHA331, CHP415 and CHT320.

**Topics**
- User documentation, design rules, operation – and maintenance manuals
- On-line and off-line modifications of programs and database
- Backtranslate AC450 programs to the Function Chart builder
- Principals of Type Circuits and APC functional units and the user defined APC elements (for example C2PB) in the AC450 and AC160
- Signal transfer from AC160 to AC450/HSI using DSP (Data Set Peripheral) and Event Sets
- Learning to trace signals and alarms/events from the I/O point up to the HSI and vice versa
- Software structure of open loop, closed loop and protection functions. Cycle time of programs and communication
- How to correctly replace redundant modules (PM6x5, etc)
- Backup and Restore operations (what, how and how often)
- Maintain application data consistently (type circuits, user disk handling, types of loading/dumping, flash card burning
- Hardware and software structure of EGATROL 8, cabinet layout, AF100 bus layout, redundancy
- Adding I/O signals at the Function chart builder and load it to the AC450/AC160
- Housekeeping tasks in the UNIX environment
- HSI plant pictures, alarms, events, system messages
- Defining and using APC at the AS500OS
- Understanding the fundamentals of historical data of IMS/AEH
- Adding, modifying and deleting objects in the history database

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**CHP442**

Advant Controller 160 and 450, Configuration and Operation

**Course goal**
The course goal is to teach students how to configure and operate Advant Controller 450 and 160 Series with remote S800 I/O in relation to CC and GT Power Generation Applications.

**Learning objectives**
- Upon completion of this course, students will be able to program Advant Controller 450 and 160 using Advant Station 100 Series Engineering Stations

**Participants**
System, process and application engineers. Maintenance, service and commissioning engineers.

**Prerequisites**
Basic knowledge of the Control Builder A and MS Windows
2 Years working experience on power plants with AC450’s and AC160’s.

**Topics**
- AMPL programming methods
- How to define, dimension and populate a data base
- AdvaBuild Function Chart Builder and On-line Builder software:
  - PC and DB Configuration, Dumping and loading, Testing, Documentation
  - Data communication via Advant Fieldbus 100 incl. event sets
- Multiprocessing and redundancy of AC160

**Methods**
Lectures, demonstrations, practical exercises.

**Duration**
5 days
Power Generation

**Methods**
Lectures, practical exercises and demonstrations

**Duration**
10 days

### CHP414
**TURBOTROL Application and Maintenance**

**Course goal**
The course goal is to prepare students for application and maintenance of steam turbine controller TURBOTROL.

**Learning objectives**
- Describe architecture and configuration of system
- Outline control, protection and communication functions
- Outline idea of function modularization and structure of plant pictures
- Load, dump and start application Software
- Perform test, simulation and fault finding, on-line and off-line modifications
- Start and shut down ST system

**Participants**
Maintenance, service and application engineers.

**Prerequisites**
Knowledge corresponding to courses CHA331, CHP415 and CHT320
Knowledge on automation and control (open and closed loop control)
Basic knowledge power plant process

**Topics**
- Hardware structure, I/O’s, controllers, interfaces, and power supply
- Software structure of open loop, closed loop and protection functions. Cycle time of programs and communication
- Closed loop control design, open loop control design, sequencer, function groups
- Protection functions, communication functions
- HSI plant pictures, alarms, events, system messages
- System loading, dumping and start application Software
- On-line and off-line modifications of programs and database
- Test and fault finding HW, SW and tool
- Start and shut down GT system with test simulator, preconditions
- Interpretation of messages and values

**Methods**
Lectures, practical exercises and demonstrations

**Duration**
5 days for complete course
1 day (1st day) for students who only need theoretical overview
3 days for students who already know EGATROL (CHP412)

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### CHP412
**EGATROL Application and Maintenance**

**Course goal**
The course goal is to prepare students for application and maintenance of Gas Turbine Controller EGATROL M

**Learning objectives**
- Describe architecture and configuration of system
- Outline control, protection and communication functions
- Outline idea of function modularization and structure of plant pictures
- Load and start application Software
- Perform test, simulation and fault finding, on-line and off-line modifications
- Start and shut down GT system with test simulator

**Participants**
Maintenance, service, application, system and process engineers.

**Prerequisites**
Knowledge corresponding to courses CHA331, CHP415 and CHT320.
Knowledge on automation and control (open and closed loop control)
Basic knowledge GT and CC process

**Topics**
- Hardware structure, I/O’s, controllers, interfaces, and power supply
- Software structure of open loop, closed loop and protection functions. Cycle time of programs and communication
- Modularization, APC, TC and PC elements function and application
- Closed loop control design, open loop control design, sequencer, function groups
- Protection functions, communication functions
- HMI plant pictures, alarms, events, system messages
- System loading, and start application Software
- On-line and off-line modifications of programs and database
- Test and fault finding HW, SW and tool
- Start and shut down GT system with test simulator, preconditions
- Interpretation of messages and values

**Methods**
Lectures, practical exercises and demonstrations

**Duration**
4 days for complete course
Power Generation

CHP420
PGIM with System 800xA
Basic Course

Course goal
The course objective is to teach participants how to use the PGIM System for Process Information Management and Analysis.

Learning objectives
Configure and maintain the PGIM System for 800xA as well as the PGIM Application Server and reports.

Participants
The intended audience for this course module may consist of advanced Operation & Maintenance Engineers, System Engineers and Commissioning & Service Engineers.

Prerequisites
PC and Windows Fundamentals, Excel, basic knowledge of power plant processes and DCS equipment.
Course CHT314 or CHT320 - System 800xA Basic Configuration,
Course CHP420 - PGIM with System 800xA Basic Course

Topics
– The PGIM System Layout
– PGIM system diagnostic tools
– PGIM automatic and manual installation
– Installation and configuration of the PGIM 800xA system extensions
– PGIM server installation and configuration
– PGIM client installation and configuration behind a firewall
– PGIM VB API for Report template configuration
– PGIM technical calculations, basic functionality
– Overview of additional tools in PGIM standalone system suite

Methods
Lectures, demonstrations, practical exercises.

Duration
2 days

CHP433
Procontrol P13/42
Basics and Application

Course goal
The course goal is to prepare students for maintenance and application of P13/42 in the field of Plant Automation Applications.

Learning objectives
– Describe architecture and configuration of system
– Outline input, output and processing functions
– Use Function blocks and documentation
– Trace signals and interpret system messages
– Configure, implement and test applications
– Use of low level service tool

Participants
Maintenance, service, application, system and process engineers.

Prerequisites
Knowledge on plant automation and control systems
Basic knowledge of plant processes

Methods
Lectures, demonstrations, practical exercises.

Duration
3 days

CHP421
PGIM with System 800xA
Advanced Course

Course goal
The course objective is to teach participants how to use and configure the PGIM System for Process Information Management and Analysis.

Learning objectives
Upon completion of this course, the trainee will be able to install and configure the PGIM System for 800xA and have a deeper understanding of the use and maintenance of the system.

Participants
The intended audience for this course module may consist of advanced Operation & Maintenance Engineers, System Engineers and Commissioning & Service Engineers.

Prerequisites
PC and Windows Fundamentals, Excel, basic knowledge of power plant processes and DCS equipment.
Course CHT314 or CHT320 - System 800xA Basic Configuration,
Course CHP420 - PGIM with System 800xA Basic Course

Topics
– The PGIM System Layout
– System 800xA integration
– How to use and configure the Historical database.
– How to use and configure the Event Management system
– How to use and configure Historical Reports
– How to use and configure Maintenance Reports
– How to use and configure Trip Reports
– How to use and configure the Archive Manager
– How to use and configure the thin web client

Methods
Lectures, demonstrations, practical exercises.

Duration
3 days
Power Generation

Topics
- Basics of PROCONTROL P:
  Overview, structure, components, technical terms, arrangement, power supply
- Local Bus System: data flow, telegrams, components
- Input and Output Modules: functions, applications
- Processing and Drive Control Modules: functions, applications
- Intraplant Bus System: data flow, telegrams, components
- Local bus coupling modules with standardized serial interface, data transmission
- Function Blocks: basic functions, multifunctions
- Application example: generation and loading programs
- Application of low level engineering tool
- Documentation: designation system, documentation concept, signal tracing

Methods
Lectures, practical exercises and demonstrations (depending on system availability)

Duration
5 days

CHP434
Progress 3 Basics and Application

Course goal
The course goal is to prepare students for the application of Progress 3 planning and service tool in the field of Plant Automation Applications.

Learning objectives
- Understand Progress 3 system functions
- Generate and modify functional diagrams
- Generate programs and loading processors
- Monitor and simulate signals online

Participants
Maintenance, service, application, system and process engineers.

Prerequisites
General knowledge on automation and control systems
Procontrol P13 knowledge corresponding to course CHP433

Topics
- Introduction:
  System overview, PC Hardware, operating system, interfaces to control system
- Engineering:
  Entering and verification of engineering information
  Input / Outputs, functions, signal-network, bus structure
- Load modules:
  Code generation, loading processors, programming EPROMs
- Debugger:
  Functions, handling instructions, recording of process signals

- Application example:
  Initializing, main menu, functional diagram editor, hardware editor

Methods
Lectures, practical exercises and demonstrations (depending on system availability)

Duration
4 days

CHP435
EDS P3 Engineering and Service Tool

Course goal
The course goal is to prepare students to use the engineering and service tool EDS P3 in the field of Plant Automation Applications.

Learning objectives
- Handle and utilize the EDS-P3 tool
- Generate and modify functional diagrams
- Generate programs and loading processors
- Monitor and simulate signals online

Participants
Maintenance, service, application, system and process engineers.

Prerequisites
General knowledge on automation and control systems
Procontrol P13 knowledge corresponding to course CHP433

Topics
- Introduction:
  Main features, documents generated, debugging facilities
- Basic handling:
  Manuals, help functions, user shell
- Engineering:
  Entering and verification of engineering information, processing data, use of HW documentation (signal flow diagrams)
- Debugging facilities:
  Displaying and forcing signals, modifying parameters, locate HW module failures, signal tracing, use of test module
- Load modules:
  Code generation, loading processors, programming EPROMs
- Backup and restore, data transfer EDS to operating station

Methods
Lectures, practical exercises and demonstrations (depending on system availability)

Duration
4 days
Power Generation
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