Invensys Learning Solutions
Invensys Learning Services has designed a curriculum of more than 200 courses and services to maximize the expertise of your workforce. Our training solutions are designed to help maximize plant availability and utilization through:

- Establishing consistency of methods and applications
- Managing risks through reducing incorrect methods, applications, and design
- Maximizing revenue and margins through improved performance

Instructor-led Classroom Learning
Classes are regularly scheduled at Invensys world-class Learning Centers in Foxboro, MA, Irvine, CA, Lake Forest, CA, Burlington, Ontario, Montreal, Quebec, and Houston and Webster, TX as well as many facilities around the globe. Most classes are five or ten days in duration, and balance lectures with practical hands-on lab exercises.

Instructor-led On-Site Learning
If you prefer, we’ll bring our classroom to you. This can be a cost-effective means of training a large group of students.

Distance Learning
Invensys learning customized live, virtual classes can bring you best practices, specific learning and technologies from experts around the globe right into your plant.

Custom Learning
Invensys learning has conducted hundreds of custom training sessions for Operators, Engineers, and Maintenance Technicians. The course materials and software are customized to your unique requirements and environment for guaranteed success.

Advanced Process Simulations (APS)
Advanced Process Simulations from Invensys Learning Services utilize the elite technology of Invensys SimSci-Esscor to create a virtual replica of your company’s process. The system appears and reacts exactly as your own system does. Through APS, your people can achieve the equivalent of up to six years on-the-job training in just one month – without impairing your live system.

Online Learning Series
Invensys Learning’s self-study programs bring unparalleled flexibility to your learning program. As the first recipient of the Massachusetts Interactive Media Council Award, our computer-
based training sets the highest standards. Invensys Learning’s Internet based products can be accessed from anywhere, anytime, and give users the benefit of instructor interface.

Training Growth Fund
Maximize returns from your training investments. Invensys Learning’s Training Growth Fund doubles the investment Invensys support agreement customers make with a dedicated training fund.

For More Information
Details about these and other programs can be found online at http://iomtraining.invensys.com/iom or call us at 866.746.6477.

http://iomtraining.invensys.com

- Download our course catalogue
- Locate our learning centers around the world
- Get travel and accommodation information fast

Experience Counts
All Invensys Learning instructors have met our strict Invensys Learning Services expertise and experience standards.
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Foxboro Evo™ System – Instructor-led Courses

5000 Foxboro Evo Configuration
This instructor-led course will help increase plant availability and utilization by enabling plant engineering personnel to generate Foxboro Evo Control HMI displays, build simple control loops, and understand general system diagnostic messages from a process and maintenance engineer's perspective. Participants will learn to identify major hardware and software components of the Foxboro Evo System. Participants will also learn the mechanisms and priorities used in process alarm reporting and will be taught to enable and disable alarm reporting. This course also introduces the programming steps needed to access and engineer the Historian. You will learn to manipulate data using mathematical functions. You will also practice configuring the Historian server to retrieve data and reports into a Microsoft Excel spreadsheet or Web-based application, among other tasks. This hands-on course is designed to give you up-to-date information on creating, managing, and interrogating this sophisticated database. The classroom instruction and practical laboratory exercises will lay the groundwork for more advanced Foxboro Evo System courses. This course is made up of Invensys Learning courses 5001 week 1 and 5004 week 2 (Course code 5000)

Duration: 10 Days

Who should attend?
Personnel who are responsible for Foxboro Evo System configuration and software maintenance. This course is also intended for personnel responsible for retrieving and distributing data on process or plant performance and operations

Prerequisites
• Working knowledge of personal computers and Microsoft Excel
• Minimum of six months experience using process control computers

Objectives
• Identify basic hardware components of the MESH network, its functions, and interrelationships.
• Describe the function of an operating system and execute elementary commands on Foxboro Evo System to support maintenance tasks.
• Demonstrate use of the Control Editor to construct and generate simple process control schemes.
• Demonstrate testing of control loops using default Control HMI process displays.
• Use the Control HMI to construct process displays that interact with live process data.
• Make on-line modifications to real-time and historical trend displays.
• Interpret results and demonstrate modification of predefined alarm schemes.
• Assign control block alarm events to Annunciator Keyboard LEDs and displays.
• Assign programs to Annunciator Keyboard push-buttons.
• Describe the process of modifying the Foxboro Evo System configuration.
• Describe standard system diagnostic and support tools available with the System Manager.
• Operate the Historian to insert, update, retrieve, and display archived and live plant data.
• Operate the Historian to import and store off-line data (old data).
• Operate the Historian to configure advanced Event Detectors and Event Actions.
• Perform Historian archiving operations.
• Set up production-related reporting within Microsoft Excel and Word and publish InSQL reports.
• Set up the Historian and access data with the SQL query statement.
• Use Historian utilities to access and modify instances.
• Configure an instance to include both events activated by user-defined conditions and by data import values.
• Describe data storage planning.

5001 Foxboro Evo Configuration Essentials
This instructor-led course will help plant availability and utilization by enabling plant engineering personnel to generate Control HMI displays, build simple control loops, and understand general diagnostic messages from a process and maintenance engineer’s perspective. Participants will learn to identify major hardware and software components of the Foxboro Evo System. They will also learn the mechanisms and priorities used in process alarm reporting and will learn to enable and disable alarm reporting. Classroom instruction and practical laboratory exercises will lay the groundwork for more advanced Foxboro Evo System courses. (Course code 5001)

Duration: 5 Days

Who should attend?
Process and System Engineers responsible for configuration of process control loops, displays and security of their Foxboro Evo System
Prerequisites
- Working knowledge of personal computers and plant processes
- Minimum of six months experience using process control computers

Objectives
- Identify basic hardware components of the MESH network, its functions, and interrelationships
- Describe the function of an operating system and execute elementary commands on an Foxboro Evo System to support maintenance tasks
- Demonstrate use of the Control Editor to construct and generate simple process control schemes
- Demonstrate testing of control loops using default Control HMI process displays
- Use the Control HMI to construct process displays that interact with live process data.
- Make on-line modifications to real-time and historical trend displays
- Interpret results and demonstrate modification of predefined alarm schemes
- Assign control block alarm events to Annunciator Keyboard LEDs and displays
- Assign programs to Annunciator Keyboard push-buttons
- Describe the process of modifying a Foxboro Evo System configuration
- Describe the standard system diagnostic and support tools available with the System Manager

5001FV Foxboro Evo Configuration Essentials with FoxView
This instructor-led course will help plant availability and utilization by enabling plant engineering personnel to generate FoxView displays, build simple control loops, and understand general diagnostic messages from a process and maintenance engineer’s perspective. Participants will learn to identify major hardware and software components of the Foxboro Evo System. They will also learn the mechanisms and priorities used in process alarm reporting and will learn to enable and disable alarm reporting. Classroom instruction and practical laboratory exercises will lay the groundwork for more advanced Foxboro Evo System courses. (Course code 5001FV)

Duration: 5 Days

Who should attend?
Process and System Engineers responsible for configuration of process control loops, displays and security of their Foxboro Evo System
Prerequisites

- Working knowledge of personal computers and plant processes
- Minimum of six months experience using process control computers

Objectives

- Identify basic hardware components of the MESH network, its functions, and interrelationships
- Describe the function of an operating system and execute elementary commands on an Foxboro Evo System to support maintenance tasks
- Demonstrate use of the Control Editor to construct and generate simple process control schemes
- Demonstrate testing of control loops using default Control HMI process displays
- Use FoxView to construct process displays that interact with live process data.
- Make on-line modifications to real-time and historical trend displays
- Interpret results and demonstrate modification of predefined alarm schemes
- Assign control block alarm events to Annunciator Keyboard LEDs and displays
- Assign programs to Annunciator Keyboard push-buttons
- Describe the process of modifying a Foxboro Evo System configuration
- Describe the standard system diagnostic and support tools available with the System Manager

5004 Historian

This instructor-led course helps increase plant utilization by introducing the programming steps needed to access and engineer the Historian. This course will provide the participant with a fundamental understanding of the role of the Historian as a plant-wide historian and data provider. The course is also designed to provide the participant with a fundamental understanding of how the Historian client can be used to report and analyze historian data. You will also practice configuring a Historian server to retrieve data and reports into a Microsoft Excel spreadsheet or Web-based application, among other tasks. This hands-on course is designed to give you up-to-date information on creating, managing, and interrogating this sophisticated database. (Course code 5004)

Duration: 5 days
Who should attend?
Managers and engineers responsible for retrieving data on process or plant performance or on plant operations

Prerequisites
- Invensys Learning course 5001
- Familiarity with Microsoft Office

Objectives
- Operate the Historian application to insert, update, retrieve, and display archived and live plant data.
- Operate the Historian application to import and store off-line data (old data)
- Operate the Historian application to configure advanced event detectors and event actions.
- Perform Historian archiving operations.
- Set up production-related reporting within Microsoft Excel and Word, and publishing InSQL reports.
- Set up the Historian and access data with the SQL query statement
- Use Historian utilities to access and modify instances.
- Configure an instance to include both events activated by user-defined conditions and data import values.
- Describe data storage planning.

5005 Foxboro Evo Control HMI
This instructor-led course helps increase plant-utilization and lower engineering cost through effective design and use of Foxboro Control System(FCS) development tools. This hands-on course is intended for customers using the Control HMI as the display application for the Foxboro Evo System. Students will learn to use built-in Control HMI functionality as well as creating custom functionality for their specific application using WindowMaker and the Control Editor. (Course code 5005)

Duration: 5 days

Who should attend?
Process control engineers and technicians who are responsible for building or maintaining the Control HMI application and/or application objects
Prerequisites

- A basic knowledge of programming or scripting concepts is helpful
- Invensys Learning course 5001

Objectives

- Create and edit graphical objects in the Control HMI
- Reduce engineering efforts by using templates for graphical objects
- Create scripts using the WindowMaker script editor and the Control Editor
- Identify built-in scripts/script functions and use them to reduce development time on an application
- Configure alarm displays for the Control HMI
- Configure trend displays for the Control HMI
- Configure security for the Control HMI

5012 Foxboro Evo Control Security Services
This instructor-led workshop will help make engineers familiar with key security features available in Foxboro Evo System Control Security Services. The workshop will enable the participant to understand the settings and setup of the Control Security Services management settings. This workshop will also introduce participants to workstation hardening, types of installation, modifications of Active Directory and trouble shooting and recovery techniques. (Course code 5012)

Duration: 5 days

Prerequisites

- Invensys Learning course 2000, 2001, 5000 or 5001
- Experience in critical infrastructure control systems and their relationship to modern IT networks
- At least one year experience in process control system administration

Who should attend?
Plant engineers with I/A Series system security responsibilities and background

Objectives

- Describe key enhancements contained in Foxboro Evo System Control Security Services
- Describe use of the system definition software
• Describe procedures needed to perform Windows hardening on both Windows 7 and
server class stations.
• Review Active Directory enhancements and settings.
• Review troubleshooting techniques for Active Directory.
• Save Active directory settings from a Primary Domain Controller.
• Review the install procedures for 8 types of installs of PDC.
• Review Day 1 procedures and workarounds.
• Work with the McAfee ePolicy Console to work with settings of Firewalls and
Whitelisting
• Use available documentation, configurators, tools, and utilities to analyze and
troubleshoot Control Security Services issues

5090 Foxboro Evo Virtualization Server
This instructor-led workshop is intended for system and network engineers responsible for
supporting virtualization servers and operator workstations using thin clients. This course will
cover the use of Microsoft Hyper-V server and the administration of virtual images. Attendees
will backup and restore virtual images to the server to demonstrate the reliability and versatility
of this platform. (Course code 5090)

Duration: 3 days

Prerequisites
• Invensys Learning course 2007 System administration for Windows
• Invensys Learning course 2012 or 5012
• Equivalent knowledge from field experience of 2007, 2012, 5012
• At least one year experience in Process Control Administration

Who should attend?
Application and Control engineers responsible for the administration of Foxboro systems and
maintaining virtualization servers

Objectives
• Describe requirements and advantages of a virtualization server
• Describe procedures to maintain a virtualization server and virtual images for Primary
Domain Controller, Galaxy repository, Display Server, and Historian Server
• Describe Network requirements and setups for connecting a virtualization server to a
MESH network and engineering networks
• Describe how to manage thin client connections.
• Save and recover virtual stations using Microsoft Hyper-V tools
• Utilizing all available documentation, use assigned configurators, tools, and utilities to analyze and troubleshoot the virtualization server

5100 Foxboro Evo Integrated Control
This instructor-led course will help you increase plant utilization and availability by making familiar the control blocks and algorithms available for designing control databases using the Control Editor. This course focuses on parameters and algorithms required for continuous control applications, such as cascade, ratio, feedforward, and adaptive control loops. Included in the course are procedures for executing real-time complex mathematical calculations at the loop level. Fail-safe strategies and procedures are also discussed in this course. This course also makes familiar the procedures for designing ladder logic programs using the ladder logic diagram editor and designing sequence programs using the Control Editor HLBL and the Sequential Function Chart editor. These programs are typically used to automate the startup or shutdown of a process, as well as in batch processes. You will build and test ladder logic control and sequential control schemes. The course includes extensive laboratory sessions to allow participants to both practice and test procedures learned. This course is made up of Invensys course 5101 week 1 and 5102 week 2 (Course code 5100)

Duration: 10 Days

Who should attend?
Control and Process Control engineers and technicians responsible for the design, installation, testing, or maintenance of control schemes using the Control Editor

Prerequisites:
• Invensys Learning course 5000 or 5001
• Invensys Learning course 6211, Process Control Technology or equivalent knowledge

Objectives:
• Utilize control block parameters to construct and verify the operation of cascade, feedforward, ratio, multiple output, and discrete control schemes
• Employ the use of control parameters to enable output tracking, alarm filtering and loop initialization
• Configure Fieldbus modules for desired fail-safe operation and measurement resolution.
• Implement complex real-time calculations in control loops using advanced calculation blocks
• Employ I/A Series System PIDA, FBTUNE, and other control blocks to configure and test adaptive control schemes
• Understand the use of the different types of control algorithms available
• Employ the PLB block, and other control blocks, to configure and test ladder logic control strategy
• Describe the functions of sequence control blocks and how they interact with each other
• Operate, configure, and program the monitor and timer, independent, dependent, and exception sequence blocks
• Use preprocessor commands in conjunction with Macros and include files
• Program and test subroutines and standard block exception handlers
• Use the Control Editor Sequence Function Chart editor to program and test sequence control blocks

5101 Foxboro Evo Continuous Control
This instructor-led course will help you increase plant utilization and availability by making familiar the control blocks and algorithms used in designing continuous control databases using the Control Editor. This course focuses on parameters and algorithms required for continuous control applications, such as cascade, ratio, feedforward, and adaptive control loops. Included in the course are procedures for executing real-time complex mathematical calculations at the loop level. Fail-safe strategies and procedures are also discussed in this course, which includes extensive laboratory sessions to allow participants to both practice and test procedures learned. (Course code 5101, 5101FV same objectives with FoxView as the HMI)

Duration: 5 Days

Who should attend?
Control and Process Control engineers and technicians responsible for the design, installation, testing, or maintenance of control schemes using the Control Editor

Prerequisites:
• Invensys Learning course 5000, or 5001
• Invensys Learning course 6211, Process Control Technology or equivalent knowledge
Objectives:

- Utilize control block parameters to construct and verify the operation of cascade, feedforward, ratio, multiple output, and discrete control schemes
- Employ the use of control parameters to enable output tracking, alarm filtering, and loop initialization
- Configure Fieldbus modules for desired fail-safe operation and measurement resolution
- Implement complex real-time calculations in control loops using advanced calculation blocks
- Employ PIDA, FBTUNE, and other control blocks to configure and test adaptive control schemes
- Understand the use of the different types of control algorithms available in a Foxboro Evo System

5101FV Foxboro Evo Continuous Control with FoxView

This instructor-led course will help you increase plant utilization and availability by making familiar the control blocks and algorithms used in designing continuous control databases using the Control Editor. This course focuses on parameters and algorithms required for continuous control applications, such as cascade, ratio, feedforward, and adaptive control loops. Included in the course are procedures for executing real-time complex mathematical calculations at the loop level. Fail-safe strategies and procedures are also discussed in this course, which includes extensive laboratory sessions to allow participants to both practice and test procedures learned. (Course code 5101Fv. This class uses FoxView as the HMI)

Duration: 5 Days

Who should attend?

Control and Process Control engineers and technicians responsible for the design, installation, testing, or maintenance of control schemes using the Control Editor

Prerequisites:

- Invensys Learning course 5000, or 5001
- Invensys Learning course 6211, Process Control Technology or equivalent knowledge

Objectives:

- Utilize control block parameters to construct and verify the operation of cascade, feedforward, ratio, multiple output, and discrete control schemes
• Employ the use of control parameters to enable output tracking, alarm filtering, and loop initialization
• Configure Fieldbus modules for desired fail-safe operation and measurement resolution
• Implement complex real-time calculations in control loops using advanced calculation blocks
• Employ PID, FBTUNE, and other control blocks to configure and test adaptive control schemes
• Understand the use of the different types of control algorithms available in a Foxboro Evo System

5102 Foxboro Evo Sequence Control and Ladder Logic
This instructor-led course will help you increase plant utilization and availability by making familiar the procedures and processes for designing sequence and ladder logic programs using the Control Editor. These programs are typically used to automate the start-up or shut-down of a process as well as in batch processes. This course uses the Control Editor ladder logic diagram editor to implement ladder logic schemes and HLBL and Sequential Function Chart editor to design sequence programs. These programs are typically used to automate the startup or shutdown of a process, as well as in batch processes. The course includes extensive laboratory sessions to allow participants to both practice and test procedures. (Course code 5102, 5102FV – same objectives with FoxView as HMI)

Duration: 5 Days

Who should attend?
Control and Process Control engineers and technicians responsible for the design, installation, testing or maintenance of control schemes involving ladder logic and/or sequential control schemes using the Control Editor

Prerequisites
• Invensys Learning course 5000 or 5001
• Invensys Learning course 5101
• Invensys Learning course 6211, Process Control Technology or equivalent knowledge

Objectives
• Describe the functions of sequence control blocks and how they interact with each other
• Operate, configure, and program the monitor, timer, independent, dependent, and exception sequence blocks
• Use Preprocessor Commands in conjunction with Macros and include files
• Use HLBL to create sequence control programs
• Program and test subroutines and Standard Block Exception Handlers
• Use the Sequence Function Chart editor to program sequence control blocks
• Employ the PLB block, and other control blocks, to configure and test a ladder logic control strategy

5102FV Foxboro Evo Sequence Control and Ladder Logic with FoxView
This instructor-led course will help you increase plant utilization and availability by making familiar the procedures and processes for designing sequence and ladder logic programs using the Control Editor. These programs are typically used to automate the start-up or shut-down of a process as well as in batch processes. This course uses the Control Editor ladder logic diagram editor to implement ladder logic schemes and HLBL and Sequential Function Chart editor to design sequence programs. These programs are typically used to automate the startup or shutdown of a process, as well as in batch processes. The course includes extensive laboratory sessions to allow participants to both practice and test procedures. (Course code 5102FV uses FoxView as HMI)

Duration: 5 Days

Who should attend?
Control and Process Control engineers and technicians responsible for the design, installation, testing or maintenance of control schemes involving ladder logic and/or sequential control schemes using the Control Editor

Prerequisites
• Invensys Learning course 5000 or 5001
• Invensys Learning course 5101
• Invensys Learning course 6211, Process Control Technology or equivalent knowledge

Objectives
• Describe the functions of sequence control blocks and how they interact with each other
• Operate, configure, and program the monitor, timer, independent, dependent, and exception sequence blocks
• Use Preprocessor Commands in conjunction with Macros and include files
• Use HLBL to create sequence control programs
• Program and test subroutines and Standard Block Exception Handlers
• Use the Sequence Function Chart editor to program sequence control blocks
• Employ the PLB block, and other control blocks, to configure and test a ladder logic control strategy

5200 Foxboro Evo Equipment Maintenance
This instructor-led course will help increase plant availability and reduce corrective and preventive maintenance cost by making familiar diagnostic and problem-solving procedures through lab exercises using Foxboro Evo System hardware and software. The course will also help you identify all the essential hardware and software components of the Foxboro Evo System and verify its proper installation. (Course code 5200)

Duration: 5 Days

Who should attend?
Technicians responsible for maintenance of a Foxboro Evo System

Prerequisites
• Working knowledge of personal computers
• Prior experience with digital process control equipment

Objectives
• List the basic hardware components of the Foxboro Evo Control Core Service, the MESH network, control station on the network, their functions and interrelationships
• Follow documented procedures to verify proper system installation
• For a given Foxboro Evo Control Core Service, which includes fault-tolerant stations, identify each module and peripheral device, trace all bus and cable connections, and demonstrate proper removal and replacement procedures
• Demonstrate the procedures required to replace a MESH switch
• Using the Control HMI, demonstrate the methods of accessing environments, displays, and Control Editor, and describe their purpose
• Describe how power is distributed to the Fieldbus modules and control processors
• Operate System Manager displays to access status, configuration, and fault analysis information related to the network, individual modules, and peripheral devices
• Operate System Manager displays to update the firmware of control stations and peripherals
• Utilize documentation and the proper troubleshooting techniques to resolve hardware problems

5210 Foxboro Evo System and Software Maintenance
This instructor-led course will help increase plant availability and reduce corrective and preventive maintenance cost by making familiar procedures to test and identify I/O problems encountered during hardware and software installation, system modification, and ongoing maintenance. It will also help protect plant intellectual assets and minimize the impact of unforeseen plant outages through the usage of proper archiving and restoration of Foxboro Evo System files and databases. Laboratory exercises will reinforce the procedures taught in the use of system diagnostic tools and procedures and in identifying field problems in control loops. (Course code 5210)

Duration: 5 days

Who should attend?
Technicians responsible for system backup and restore procedures, and testing communications between Foxboro Evo System equipment and I/O devices

Prerequisites:
• Working knowledge of personal computers
• Prior experience with digital process control equipment
• Invensys Learning course 5200

Objectives:
• Use basic operating system commands to support maintenance tasks
• Perform system backup and restoration procedures on Workstations
• Construct a continuous control loop using the Control Editor to monitor and control a process
• Incorporate alarming parameters into a control loop
• Utilize Control HMI displays to monitor and control a process
• Utilize Control Editor ladder logic application to control and test discrete devices
• Employ discrete control blocks to test devices
5210FV Foxboro Evo System and Software Maintenance with FoxView
This instructor-led course will help increase plant availability and reduce corrective and preventive maintenance cost by making familiar procedures to test and identify I/O problems encountered during hardware and software installation, system modification, and ongoing maintenance. It will also help protect plant intellectual assets and minimize the impact of unforeseen plant outages through the usage of proper archiving and restoration of Foxboro Evo System files and databases. Laboratory exercises will reinforce the procedures taught in the use of system diagnostic tools and procedures and in identifying field problems in control loops. (Course code 5210FV uses FoxView as HMI)

Duration: 5 days

Who should attend?
Technicians responsible for system backup and restore procedures, and testing communications between Foxboro Evo System equipment and I/O devices

Prerequisites:
• Working knowledge of personal computers
• Prior experience with digital process control equipment
• Invensys Learning course 5200

Objectives:
• Use basic operating system commands to support maintenance tasks.
• Perform system backup and restoration procedures on Workstations.
• Construct a continuous control loop using the Control Editor to monitor and control a process.
• Incorporate alarming parameters into a control loop.
• Utilize FoxView displays to monitor and control a process.
• Utilize Control Editor ladder logic application to control and test discrete devices.
• Employ discrete control blocks to test devices.

5300 Foxboro Evo System Process Operations
In this instructor-led course will help improve plant utilization and availability by providing plant staff the background necessary to perform procedures normally encountered by a process operator in the control room. Through a series of simulated control schemes, participants will learn the mechanics of operating the Control HIM by interacting with typical process displays. (Course code 5300)
Duration: 3 days

Who should attend?
Control room operators, supervisors, and process engineers responsible for day-to-day operations in the plant

Prerequisites:
- Previous control room experience using pneumatic, electronic, or digital systems

Objectives:
- Use the devices provided by the operator’s workstation to access displays, overlays, and environments and to determine which variables are operator changeable
- Given a typical process situation, recognize the occurrence of a process alarm, determine its cause, and provide appropriate response
- Operate the standard Control HIM faceplate displays and custom graphic displays
- Use the features of real-time trends to observe variations in process conditions and review historical data
- Demonstrate the methods to access information presented in the Control HMI operational and on-demand custom process reports
- In the event of a failure, acknowledge the system alarm, and identify the failed system component

5612 Foxboro Control Editor
This instructor-led course will help you increase plant availability and utilization while reducing engineering cost. Upon completion of this course, participants will be able to understand the Control Editor features and capabilities for creating control solutions and applications for a variety of automation application areas with reusability and ease of debugging and commissioning. Participants will be able to control, design, create, test, and run real-time application programs for their plant. Participants will learn to use Control Editor strategies to create control schemes. The Control Editor supports bulk generation function which you can use to generate a database using Control Station Save-Alls. Participants will also learn to use the Control Editor appearance editor which allows the building of custom functional symbols. Participants will also learn how to define system hardware and accompanying software parameters. (Course code 5612)

Duration: 5 days
Who should attend?
Process control engineers who will use the Control Editor to create, edit, document, and secure control databases, displays, and Foxboro Evo System Core Services

Prerequisites:
• Invensys Learning course 5000 or 5001
• Invensys Learning course 5100 or 5101

Objectives:
• Build a simple loop using Control Editor strategies, assign it to a compound, and download it to a control station
• Given a tag list and templates, bulk generate multiple compounds and Control Editor tool strategies
• Build user-defined objects, e.g. SAMA diagrams
• Describe and use Control Editor templates, instances, and inheritance.
• Build a custom toolbox of commonly used and custom templates
• Apply Ladder Logic control using the Control Editor, Ladder Logic editor
• Apply Sequential control using the Control Editor HLBL editor and Sequence Functional Configurator (SFC) editor
• Build a system configuration, define the hardware naming and software parameters, validate it, and create a commit disk
• Describe and use the various security, multi-user, and version control features of the Control Editor
• Back-up, restore, and verify Control Editor databases

5625 Foxboro Evo InBatch
This instructor-led course will help you increase plant availability and utilization while reducing engineering cost in developing Foxboro Evo System programs. The participant will gain practical experience with batch processing. Participants will construct a batch model based on a plant physical model and functional specification, then run and report on the batch recipes that have created. Participants will also optimize the performance of the batch control strategy using recipe phases. (Course Code 5625)

Duration: 5 days
Who should attend?
Process and control system engineers responsible for coordinating, implementing or maintaining InBatch

Prerequisites:
• Invensys Learning course 5000 or 5001
• Invensys Learning course 5100, or 5101 and 5102

Objectives:
• Given a process model, define the units, connections, and phases required to implement the batch control strategy
• Link a process model to a control strategy
• Map the process states defined in a Functional Design Specification into the sequence block states
• Program sequence blocks so that the batch interface can be used effectively and the control strategy can be easily maintained

5652 FOUNDATION Fieldbus System Engineering with Control Editor
This hands-on, instructor-led course will help improve plant availability and reliability by making familiar the concepts, tools and tasks required to engineer and integrate FOUNDATION Fieldbus devices with the Foxboro Evo System Participants will become acquainted with segment design, importing DD files and installing a DTM. Participants will create new device type templates, set security privileges and default parameter values. Participants will also create derived device type templates, create and configure device instances, associate device instances with an FBM/channel and set FBM parameters (course code 5652).

Duration: 5 days

Who should attend?
Engineers who need to design FOUNDATION Fieldbus segments, configure and integrate FOUNDATION fieldbus devices with the Foxboro Evo System

Prerequisites
• Invensys Learning course 5001 (recommended)
• Invensys Learning course 5612, (recommended)
Objectives

- Describe the publish and subscribe and client server communication methods
- Describe FOUNDATION Fieldbus loading and sizing rules and best practices
- Describe the function and link master block schedules
- Describe the macrocycle implementation
- Describe LAS responsibilities
- Use Foundation Fieldbus Device Templates in the Control Editor
- Customize download/upload behavior and FDM tabs & viewing screens in the Control Editor
- Link manuals and other documentation in the Control Editor
- Set up security by privileges and user roles in the Control Editor
- Use inheritance functions in the Control Editor
- Configure the function block in the Control Editor
- Use the Field Device Manager to commission, replace and troubleshoot devices

5700 Foxboro Evo Management Overview
This course will help managers understand how they can increase plant availability and utilization using the Foxboro Evo System. The course profiles the capabilities and major components of the Foxboro Evo System. Participants will review hardware, control strategies, and Foxboro Evo System software packages and their features. This increased system comprehension will help participants make better informed day-to-day plant decisions. (Course code 5700)

Duration: 3 days

Who should attend?
Process managers or newly promoted supervisors who need a basic understanding of the Foxboro Evo System functions and operations

Prerequisites:
- None

Objectives:
- List the major hardware components of the Foxboro Evo System, their functions, and interrelationships.
- Demonstrate the method of accessing environments, displays, and the Control Editor and describe the purpose of this configurator.
• Describe and manipulate predefined process control schemes consisting of block types.
• Describe and recognize the occurrence of a process alarm.
• Identify a failed component.
• Describe the information presented in standard and custom process reports.
• Use Control HMI trend displays and trending software packages to view real-time and historical data.
• Describe how the Control Editor is used to modify and document a predefined system configuration.
Triconex Instructor-led Courses

8100 Triconex Cyber Security
This instructor led course will help improve plant availability and utilization by providing instruction on networking fundamentals and cyber-security. The primary objective of this course is to use the software tools and hardware modules; including the TriStation 1131 Developer’s Workbench, communications devices, and Tofino to implement cyber-security on your Triconex system. Students will learn to effectively secure TRICON/TRIDENT controllers within a network to protect the system and communications from unauthorized exposure and external interference. Student labs and practical exercises will validate learning by configuring and resolving system connectivity issues. Successful completion of this course will reduce integration and installation time by effectively applying the Triconex tools and systems. Students will learn the principles of Triple Modular Redundancy (TMR) architecture. Learning objectives include: verification of network and system health, cyber-security features, networking fundamentals, Triconex hardware configuration, TriStation 1131 project security, the Tofino firewall, and describe best practices. (Course code 8100)

Duration: 3 days

Who should attend?
- Supervisory personnel responsible for the TRICON system
- Engineers and technicians responsible for supporting a TRICON system
- Plant engineers who configure and support the TRICON system

Prerequisites
- Working knowledge of Microsoft Windows operating system
- Working knowledge of Programmable Logic Controllers (PLC’s) and/or Distributed Control Systems (DCS)
- Familiar with basic electronics and maintenance procedures
- Invensys Learning 8902 TRICON/TriStation 1131 Comprehensive

Objectives
- Describe the basic theory and operation of the TRICON TMR system
- Describe the fundamentals of networking
- Configure and troubleshoot Triconex communications devices
  o Triconex Keyswitch settings
  o TRICON Communications Module (TCM)
- Setup and implement the Tofino firewall
- Implement TriStation 1131 Developer’s Workbench project security
- Describe and implement cyber-security features
8300 Triconex-Wonderware Operator
This instructor-led course will help improve plant availability and utilization by providing instruction for operators to monitor and maintain plant operations. The training environment simulates the plant environment, allowing students to work with processes and instrumentation. Using the TRICON® safety system and Wonderware InTouch® screens, the training will provide displays that are configured for plant operations. This comprehensive training program tests students on real-time decision making on alarm recognition and response. Learning modules cover 1) System configuration 2) Describe the control/safety application 3) Overview of Process simulation screens, 4) Recognize and respond to Alarms 5) Modify Set points 6) Troubleshooting and preventive maintenance. (Course code 8300)

Duration: 3 days

Who should attend?
- Supervisory personnel responsible for the Triconex system
- Technicians responsible for installing and maintaining the Triconex system
- Plant Engineers who configure and support the Triconex system

Prerequisites
- Working knowledge of Microsoft Windows operating system
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures
- Invensys Learning 8902 TRICON/TriStation 1131 Comprehensive or Invensys Learning 8906 TRIDENT/TriStation 1131 Comprehensive

Objectives
- Describe the hardware and implementation of the TRICON® controller
- Describe the basic features of the Wonderware InTouch® system
- Establish communications between the TRICON® and Wonderware display
- Describe a Control Program in TriStation 1131
- Read Wonderware displays, using WindowMaker® and WindowViewer®
- Change set points and force points from the Wonderware display
- Recognize and respond to alarms

8601 Triconex General Purpose/TriStation 1131 Basic Maintenance
This hands-on instructor-led course will help improve plant reliability and robustness by covering all aspects of Triconex General-Purpose (Tri-GP) implementation and maintenance. Participants are taught the principles of Triconex General-Purpose redundant architecture, system configuration, programming, maintenance and troubleshooting of the system. Using the
Tristation 1131 Developer’s Workbench; participants configure program a system with digital and analog I/O. Participants get practical experience in system operation such as downloading new programs and disabling and forcing I/O points. (Course code 8601)

Duration: 2 Days

Who should attend?
- Supervisory personnel responsible for the Tri-GP system
- Technicians responsible for installing and maintaining the Tri-GP system
- Plant Engineers who configure and support the Tri-GP system

Prerequisites
- Working knowledge of Microsoft Windows operating system
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures

Objectives
- Triconex General-Purpose System Overview
  - Describe the basic theory of operation of the Tri-GP architecture
  - Identify Components
  - Replace Modules
  - Respond to Alarms
- Use Enhanced Diagnostic Panel
  - Monitor Status
  - Troubleshoot
  - Collect Events
- Tristation 1131 Developers Workbench
  - Developing a Project
  - Function Block Diagram Programming
- Downloading and Online Maintenance
  - Download procedures to the Tri-GP system
  - Online maintenance and forcing points
  - Download Changes
- Maintenance and Troubleshooting
  - Use Enhanced Diagnostic Monitor
  - Preventive maintenance techniques
- System Administration
8601A TRI-GP Advanced Maintenance

This 2-day hands-on, instructor-led, advanced course will improve plant safety and availability by instructing students in advanced TRI-GP® maintenance techniques. Primary course objectives include indentifying and responding to internal, external, and field faults. Basic TRI-GP® implementation, maintenance and troubleshooting of the system will be reviewed at the start of the course. Students will learn and be evaluated on their understanding of maintenance scenarios and troubleshooting skills using advanced level techniques.

Students will also use the features of the Enhanced Diagnostic Monitor (EDM) of the Windows-based TriStation 1131 Developer’s Workbench to troubleshoot, respond to alarms, replace modules, and clear faults. (Course code 8601A)

Duration: 2 Days

Who should attend?
- Supervisory personnel responsible for the Triconex system
- Technicians responsible for installing and maintaining the Triconex system
- Plant Engineers who configure and support the Triconex system

Prerequisites
- Working knowledge of Microsoft Windows operating system
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures
- Invensys Learning 8601 Triconex GP Basic Maintenance

Objectives
- Describe the basic theory of operation of the Trident TMR architecture
- Describe the operational concepts and basic features of TriStation 1131
- Recognize and respond to Internal faults
- Recognize and respond to External faults
- Recognize and respond to System Faults
- Disable and Force Points in maintenance application
- Use Diagnostic Panel for General Maintenance and Troubleshooting
- Display Firmware Status
- Collect System Events
- General Maintenance and Troubleshooting
8602 Triconex General Purpose/TriStation 1131 Comprehensive
This hands-on instructor-led course will help improve plant reliability and robustness by covering all aspects of Triconex General-Purpose (Tri-GP) implementation and maintenance. Participants are taught the principles of Triconex General-Purpose redundant architecture, system configuration, programming, maintenance and troubleshooting of the system. Using the TriStation 1131 Developer’s Workbench; participants configure program a system with digital and analog I/O. Participants get practical experience in system operation such as downloading new programs and disabling and forcing I/O points. (Course code 8602)

Duration: 5 Days

Who should attend?
- Supervisory personnel responsible for the Tri-GP system
- Technicians responsible for installing and maintaining the Tri-GP system
- Plant Engineers who configure and support the Tri-GP system

Prerequisites
- Working knowledge of Microsoft Windows operating systems
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures
- Invensys Learning 8601 Triconex GP Basic Maintenance and Invensys Learning 8601A Triconex GP Advanced Maintenance

Objectives
- Triconex General-Purpose System Overview:
  - Describe the basic theory of operation of the Tri-GP architecture
  - Identify Components
  - Replace Modules
  - Respond to Alarms
- TriStation 1131 Developers Workbench:
  - Developing a Project
  - Function Block Diagram Programming
- Downloading and Online Maintenance:
  - Download procedures to the Tri-GP system
  - Online maintenance and forcing points
  - Download Changes
- Maintenance and Troubleshooting:
  - Use Enhanced Diagnostic Monitor
  - Preventive maintenance techniques
- System Administration
8901 TRICON/TriStation 1131 Basic Maintenance
This hands-on, instructor-led course will help improve plant availability and utilization by providing an overview of the TRICON system with a primary focus on maintenance and troubleshooting. Participants are taught basic principles of Triple Modular Redundant (TMR) architecture and system configuration including field wiring, power distribution, and module capabilities. Participants get practical experience with continuity checks, loop testing, and general field maintenance. Using the Enhanced Diagnostic Monitor (EDM) of the Windows-based TriStation 1131 Developer’s Workbench, participants troubleshoot, respond to alarms, replace modules, and clear faults. (Course code 8901)

Duration: 2 days

Who should attend?
- Supervisory personnel responsible for the TRICON system
- Engineers and technicians responsible for supporting a TRICON system
- Plant engineers who support and maintain the TRICON system

Prerequisites
- Working knowledge of Microsoft Windows operating systems
- Working knowledge of Programmable Logic Controllers (PLC’s) and/or Distributed Control Systems (DCS)
- Familiar with basic electronics and maintenance procedures

Objectives
- Describe the basic theory of operation of the TRICON’s TMR architecture
- Install and wire a TRICON system
- Learn basic navigation of the TriStation 1131 Developer’s Workbench
- Perform continuity and loop testing
- Diagnose and troubleshoot a TRICON

8901A TRICON Advanced Maintenance
This hands-on, instructor-led course will help improve plant availability and utilization by providing instructing students in the most effective and advanced maintenance and troubleshooting techniques for the TRICON. Primary course objectives include identifying and responding to internal, external, and system faults. This is an intensive, hands-on, advanced scenario advanced level course that will emphasize “real-world” applications as well as some academic theory. (Course code 8901A)
Duration: 2 days

Who should attend?

• Supervisory personnel responsible for the TRICON system
• Engineers and technicians responsible for supporting a TRICON system
• Plant engineers who support and maintain the TRICON system

Prerequisites

• To effectively participate in this maintenance course, users should have prior familiarity with Windows based software.
• Students should have a working knowledge of Programmable Logic Controllers (PLC’s), Distributed Control Systems, and be familiar with basic PLC programming principles.
• Invensys Learning 8901 TRICON/TriStation 1131 Basic Maintenance

Objectives

• Describe the basic theory of TMR and Fault Tolerance
• Recognize and respond to Internal faults
• Recognize and respond to External faults
• Recognize and respond to System Faults
• Disable and Force Points in maintenance application
• Connect to and navigate the Diagnostic Panel
• Display Firmware Status
• Collect System Events
• Diagnostic Monitor troubleshooting

8902 TRICON/TriStation 1131 Configuration and Implementation

This hands-on instructor-led course will help improve plant availability and utilization by covering all aspects of TRICON® configuration and implementation. Students are taught the principles of Triple Modular Redundant (TMR) architecture and system configuration. The primary objectives of this course are to (1) configure the system, (2) setup communications, (3) Build a TriStation 1131 project, (4) assign tagname database (5) download a safety application to the controller, (6) Force points (&) Make online changes and (8) Use the Enhanced Diagnostic Monitor (EDM) to troubleshoot and recognize alarms.

Using the Windows-based TriStation 1131 Developer’s Workbench; participants learn basic navigation techniques in order to program, test and debug a program a system with digital and analog I/O. Participants will also make full use of automatically generated documentation features of TriStation 1131. Performance labs and written evaluations will validate classroom learning. (Course code 8902)
Duration: 5 Days

Who should attend?

- Supervisory personnel responsible for the Triconex system
- Technicians responsible for installing and maintaining the Triconex system
- Plant Engineers who configure and support the Triconex system

Prerequisites

- Working knowledge of Microsoft Windows operating system
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures
- Invensys Learning 8901 TRICON Basic Maintenance
- Invensys Learning 8901A TRICON Advanced Maintenance

Objectives

- Describe the basic theory of operation of the TRICON’s TMR architecture
- Navigate and use the key features of TriStation 1131
  - IEC 61131 Program Standard
  - Programs, Function Blocks, Functions
- Write a safety application using following languages:
  - Function Block Diagram
  - Structured Text
- Test and debug the safety application
- Configure a TRICON® system and database
- Perform download procedures to the TRICON® controller
  - Download Changes
  - Force Points
- Troubleshoot and maintain a TRICON® system
- Use system administration feature
  - Project Security
  - Documentation
  - Reports

8903 TriStation 1131 Standard Programming

This is an intermediate-level programming course. Using the IEC 61131-3 compliant TriStation 1131 Developers Workbench; students will be taught advanced programming techniques to write program logic from a flow chart, primarily using Function Block Diagram (FBD). Students will receive instruction to write customer function blocks, using both FBD and Structured Text (ST). The primary objective of this course is to learn the concepts of effective project
development and logic segmentation commonly used in safety and process control applications. Students develop a project, partition logic, write customer function blocks and functions, and allocate memory structure for an effective application. ‘Real World’ lab exercises require a written design statement, logic segmentation, program testing, and downloading the control program. (Course code 8903)

**Duration:** 5 Days

**Who should attend?**
- Engineers responsible for programming or maintaining a TRICON or TRIDENT system

**Prerequisites**
- Working knowledge of Microsoft Windows operating systems
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures
- Invensys Learning 8902 TRICON/TriStation 1131 Comprehensive

**Objectives**
- Describe the operational concepts and basic features of *TriStation 1131*
- Write Program logic using *TriStation 1131* Function Block Diagram editor
- Perform diagnostics using the *TriStation 1131* Diagnostic Panel
- Use the *TriStation 1131* system administration features
- Use the *TriStation 1131* documentation and variable annotation features
- Write comment macros and cross-reference program variables
- Perform download procedures to the TRICON controller
- Test and debug program logic

**8903S Triconex Safety Considerations**
This hands-on, instructor-led course will improve plant availability and utilization by teaching students to industry standard guidelines used in safety applications. *The primary objective of this course is to effectively develop* and maintain safety-critical system in a live plant environment. Practical exercises include 1) project development, 2) safety download procedures, 3) online safety application maintenance (including download changes) and 4) implementing shutdown logic. This course will emphasize “real-world” applications as well as academic theory. Each learning modules will include an instructor overview, student exercises, and validation of student learning. Using the *TriStation 1131* Developer’s Workbench, students will build a project, test and debug logic, and download a safety application to a TRICON controller. (Course code 8903S)
Duration: 3 days

Who should attend?

- Supervisory personnel responsible for the Triconex system
- Technicians responsible for installing and maintaining the Triconex system
- Plant Engineers who configure and support the Triconex system

Prerequisites

- Working knowledge of Microsoft Windows operating systems
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures
- Invensys Learning 8902 TRICON/TriStation 1131 Comprehensive Course
- Invensys Learning 8903 TriStation 1131 Standard Programming

Objectives

- Describe Safety Concepts
  - Protection layers
  - SIS factors
  - SIL factors
- Describe Application Guidelines
  - TUV certification
  - General guidelines
  - Guidelines for TRICON controllers
- Perform Fault Management
  - System architecture
  - System diagnostics
  - Types of faults
    - External faults
    - Internal faults
- Develop Safety Application
- Appendices
  - Peer to Peer
  - Safety shutdown function blocks

8905 TRIDENT/TriStation 1131 Basic Maintenance
This hands-on instructor-led basic maintenance course will help improve plant availability and utilization by covering all aspects of TRIDENT® implementation and maintenance. Students are taught the basic principles of Triple Modular Redundant (TMR) architecture, system
configuration, maintenance and troubleshooting of the TRIDENT® system. Primary objectives include alarm response, replacing modules, and general maintenance of the TRIDENT® system.

Participants get practical experience with the *TriStation 1131* Enhanced Diagnostic Monitor to troubleshoot the system. Lab exercises include communications setup, maintenance exercises to identify and respond to alarms, analyze real-time diagnostic error messages, and collecting system events. Student learning objectives are validated during the course by successfully completing written exams and performance evaluations. (Course code 8905)

**Duration:** 2 Days

**Who should attend?**
Technicians and engineers responsible for supporting a TRIDENT

**Prerequisites**
- Working knowledge of Microsoft Windows operating system
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures

**Objectives**
- Describe the basic theory of operation of the TRIDENT’s TMR architecture
  - TRIDENT Modules
  - Communications
  - Field Terminations
- Identify TRIDENT® system components
- Replace modules
- Recognize and respond to alarms
  - System alarms
  - Hardware alarms
  - Field alarms
- Use the *TriStation 1131* Enhanced Diagnostic Monitor
  - Connect to system
  - Display TRIDENT® system status
  - Troubleshoot
- Identify and clear faults
- Collect system events
- Perform general and preventative maintenance
8905A TRIDENT Advanced Maintenance
This intensive hands-on, instructor-led, advanced course will improve plant safety and availability by instructing students in advanced TRIDENT® maintenance techniques. Primary course objectives include understanding and responding to internal, external, and field faults. Basic TRIDENT implementation, maintenance and troubleshooting of the system will be reviewed at the start of the course. Students will learn and be evaluated on their understanding of maintenance scenarios and troubleshooting skills using advanced level techniques.

Students will also use the features of the Diagnostic Monitor, including responding to error messages, security, and reporting features. Students get practical experience with the Diagnostic monitor of the Windows-based TriStation 1131 Developer’s Workbench to troubleshoot, respond to alarms, replace modules, and clear faults. (Course code 8905A)

**Duration:** 2 Days

**Who should attend?**
- Supervisory personnel responsible for the Triconex system
- Technicians responsible for installing and maintaining the Triconex system
- Plant Engineers who configure and support the Triconex system

**Prerequisites**
- Working knowledge of Microsoft Windows operating system
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures
- Invensys Learning 8905 TRIDENT Basic Maintenance

**Objectives**
- Describe the basic theory of operation of the TRIDENT TMR architecture
- Describe the operational concepts and basic features of TriStation 1131
- Recognize and respond to *Internal* faults
- Recognize and respond to *External* faults
- Recognize and respond to *System* Faults
- Disable and Force Points in maintenance application
- Connect to and navigate the Diagnostic Panel
- Display Firmware Status
- Collect System Events
- General Maintenance and Troubleshooting
8906 TRIDENT/TriStation 1131 Configuration and Implementation

This hands-on instructor-led course will help improve plant reliability and robustness by covering all aspects of TRIDENT configuration and implementation. Participants are taught the principles of Triple Modular Redundant (TMR) architecture, system configuration, programming, maintenance and troubleshooting of the TRIDENT system. Using the TriStation 1131 Developer’s Workbench; participants configure program a system with digital and analog I/O. Participants get practical experience in system operation such as downloading new programs and disabling and forcing I/O points. (Course code 8906)

**Duration**: 5 Days

**Who should attend?**

- Supervisory personnel responsible for the TRIDENT system
- Technicians responsible for installing and maintaining the TRIDENT system
- Plant Engineers who configure and support the TRIDENT system

**Prerequisites**

- Working knowledge of Microsoft Windows operating systems
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures
- Invensys Learning 8905 TRIDENT Basic Maintenance
- Invensys Learning 8905A TRIDENT Advanced Maintenance

**Objectives**

- TRIDENT System Overview:
  - Describe the basic theory of operation of the TRIDENT TMR architecture
  - Identify Components
  - Replace Modules
  - Respond to Alarms
- **TriStation 1131** Developers Workbench
  - Developing a Project
  - Function Block Diagram Programming
- Downloading and Online Maintenance
  - Download procedures to the TRIDENT
  - Online maintenance and forcing points
  - Download Changes
- Maintenance and Troubleshooting
  - Use Enhanced Diagnostic Monitor
  - Preventive maintenance techniques
- System Administration
8907 Triconex-Wonderware InTouch Comprehensive

This hands-on instructor-led course will help improve plant availability and utilization by providing instruction for TRICON-Wonderware InTouch interface. This course includes expert instruction in both the TRICON safety system and the Wonderware Human-Machine-Interface (HMI) to view and maintain a safety application program. Students are taught the principles of Triple Modular Redundant (TMR) architecture, and the TRICON system configuration, and the Wonderware InTouch graphical tools including WindowMaker® and WindowViewer®.

Learning modules cover 1) Program a safety application in TriStation 1131, 2) Build Wonderware displays using WindowMaker, and 3) Monitor the communications between the control program and the Wonderware Window Viewer InTouch displays. This configuration is common to many plants to monitor operations and troubleshoot alarms. (Course code 8907)

Duration: 5 Days

Who should attend?
- Supervisory personnel responsible for the Triconex system
- Technicians responsible for installing and maintaining the Triconex system
- Plant Engineers who configure and support the Triconex system

Prerequisites
- Working knowledge of Microsoft Windows operating system
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures
- Invensys Learning 8902 TRICON/TriStation 1131 Comprehensive

Objectives
- Describe the hardware and implementation of the TRICON® controller
- Describe the basic features of the Wonderware InTouch graphical tools
- Describe communications between the TRICON® and Wonderware display
- Navigate the TriStation 1131 Programming software
- Write a Control Program in TriStation 1131
- Use InTouch to build Wonderware displays, using WindowMaker.
- View the safety application using WindowViewer.
- Establish Communications to the TRICON® Controller
Download the Control Program to the TRICON® Controller
• Force points and monitor program logic
• Display the control program on the Wonderware display
• Change set points and force points from the Wonderware display
• Verify the program changes in both the TRICON® and Wonderware

8916 Triconex TS3000 Comprehensive
This hands-on instructor-led course will help improve plant availability and utilization by making familiar configuration, programming, operations, and the maintenance of the Triconex TS3000 for turbine control. The Triconex TS3000 is used for Turbo-machinery (TMC) applications. Participants are taught the principles of Triple Modular Redundant (TMR) architecture and using the Windows-based TriStation 1131 Developer’s Workbench to configure and program a system with digital and analog I/O. Participants get practical experience in system operations, downloading new programs, changing programs on-line and forcing I/O points. (Course code 8916)

Duration: 5 Days

Who should attend?
• Supervisory personnel responsible for the Triconex TS3000 system
• Plant Technicians responsible for installing /maintaining the TS3000 system
• Plant Engineers who configure and support the Triconex TS3000 system

Prerequisites
• Basic understanding of turbine control systems
• Working knowledge of Microsoft Windows operating system
• Working knowledge of Programmable Logic Controllers or Distributed Control Systems
• Familiar with basic electronics and maintenance procedures
• Invensys Learning 8902 TRICON/TriStation 1131 Comprehensive

Objectives
• Describe the basic theory of operation of the Triconex TS3000 (TMR) system
• Identify Triconex TS3000 system hardware and TMC specific modules
  o Analog Output Module
  o Pulse Input Module
• Install and wire a Triconex TS3000 system
• Write a TMC control program using TriStation 1131
• Review and apply the TMC Specific libraries
• Download an application program to the Triconex TS3000 system
  o Download Changes
  o Force Points
• Use Enhanced Diagnostic Monitor
  o Respond to Alarms
• Clear Faults

8950 *TriStation 1131* Advanced Programming
This advanced-level programming course will help improve plant availability and utilization by providing students with effective techniques to design and implement an effective control strategy based on the IEC 61131-3 programming standard. Using the *TriStation 1131* Developers Workbench; students will be taught advanced programming techniques to write program logic from a flow chart, primarily using Function Block Diagram (FBD). *Students will also write customer function blocks, using both FBD and Structured Text. (ST)*. Primary objectives include developing a project(s) commonly used in ESD and process control applications. Students design, implement logic segmentation strategies, write customer function blocks, and allocate memory structure for an effective application. ‘Real World’ lab exercises require a written design statement, logic segmentation, program testing, and downloading the control program. (Course code 8950)

**Duration:** 5 Days

**Who should attend?**
• Supervisory personnel responsible for the Triconex system
• Technicians responsible for installing and maintaining the Triconex system
• Plant Engineers who configure and support the Triconex system

**Prerequisites**
• Working knowledge of Microsoft Windows operating system
• Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
• Familiar with basic electronics and maintenance procedures
• Invensys Learning 8903 *TriStation 1131* Standard Programming

**Objectives**
• Software Overview
  o Describe IEC 61131-3 programming concepts
  o Navigate *TriStation 1131* Developer’s Workbench
• Project Development
• Read Process and Instrumentation drawings
• Write a design statement for Furnace application

• Program Safety Application
  o Write, test, and debug Function Block Diagram
  o Write Structured Text to use custom function blocks
  o Segment logic

• Implement Control Strategy
  o Download application to controller
  o Use advanced techniques to effectively use scan time and memory
  o Use advanced programming techniques to write control program

• System Administration: Implement project security, documentation, and reports

8951 Creating Custom Function Blocks and Libraries
This advanced-level programming course will help improve plant availability and utilization by providing students with effective techniques to design custom functions and function blocks and create custom libraries for import/export. Custom libraries are a very effective method to manage project development by allowing programs to be developed remotely. Using the TriStation 1131 Developers Workbench; students will be taught advanced programming techniques to create, test and debug efficient and reusable code that minimizes impact on project scan time and memory. IEC 61131-3 compliant languages Function Block Diagram and Structured Text will be used to write the code.

Lab exercises will include instruction to write, test, debug, and download programs written in Function Block Diagram and Structured Test. Students will also write user-defined function blocks, and invoke, or ‘call’ them in an online control program. Students develop a project, partition logic, write customer function blocks and functions, and allocate memory structure for an effective application. ‘Real World’ lab exercises require a written design statement, logic segmentation, program testing, and downloading the control program. (Course code 8951)

Duration: 3 Days

Who should attend?
• Supervisory personnel responsible for the Triconex system
• Technicians responsible for installing and maintaining the Triconex system
• Plant Engineers who configure and support the Triconex system

Prerequisites
• Working knowledge of Microsoft Windows operating system
• Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
• Familiar with basic electronics and maintenance procedures
• Invensys Learning 8902 TRICON/TriStation 1131 Comprehensive
• Invensys Learning 8903 TriStation 1131 Standard Programming

Objectives
• Describe IEC 61131-3 programming concepts
• Navigate TriStation 1131 Developer’s Workbench
• Read Process and Instrumentation drawings
• Develop a TriStation 1131 project
• Write a safety application using Develop user defined functions and function blocks
• Create custom libraries for import/export
• Perform download procedures to the controller
• Use System Administration features

8963 Triconex OPC & Networking Essentials
This is an intensive, hands-on and instructor-led course that provides detailed instruction and practical exercises for the TRICON Communication Modules (TCM) with embedded OLE for Process Control (OPC) Server interface and capabilities. Classroom theory and practical exercises will include Basic TriStation 1131 programming as it relates to OPC servers/client relations and an overview of the OPC Data, and Alarm and Events as it relates to the TRICON. The primary objective of this course is to effectively learn how the TRICON Communication Modules (TCM)/with embedded OPC Sever interfaces to maintain the control. Using the Windows based TriStation 1131 Developer’s Workbench; students primarily concentrate on basic navigation techniques in order to configure and program a system with digital and analog I/O. Students also gain practical experience in system operations such as downloading new programs, disabling and forcing I/O points. Student learning will be validated by a written evaluation and performance tests. (Course code 8963)

Duration: 3 days

Who should attend?
• Supervisory personnel responsible for the Triconex system
• Technicians responsible for installing and maintaining the Triconex system
• Plant Engineers who configure and support the Triconex system

Prerequisites
• Working knowledge of Microsoft Windows operating system
• Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
• Familiar with basic electronics and maintenance procedures
• Invensys Learning 8902 TRICON/TriStation 1131 Comprehensive

Objectives
• Describe the operation and configuration of the TRICON architecture
• Describe the basic theory of TMR and Fault Tolerance
• Identify and Describe TRICON Communications Modules and Interfaces
• TriStation 1131:
  - Develop a TriStation 1131 project and write communications logic blocks
  - Configure Triconex system hardware and download a program to the TRICON
• Describe networking concepts and fundamentals
• OPC:
  - Overview
  - Security
  - Configure OPC date
• Connect to the TRICON using the embedded OPC server
• Identify Alarms and monitor values from field devices using the OPC server

8801 TUV Functional Safety Engineer Training
The TUV Training and Certification program supports knowledge, know-how, and expertise to engineers working in the field of functional safety. This course provides a clear understanding of the global and uniform standard of competence towards compliance of IEC61511-1, paragraph 5.2.2.

The first three days are classroom setting instruction that provide detailed information and examples/discussions for understanding and mastering the requirements of IEC61508 / IEC61511 functional safety. Evening study time and problem solving is recommended. The last day consists of a two part examination:

• 130 multiple choice questions
• 5 working problems
(Course code 8801)

Duration: 4 days

Who should attend?
• Engineers involved in any part of the SIS Safety Lifecycle
Prerequisites

- A minimum of 3 to 5 years in the field of functional safety
- University degree or equivalent engineering responsibilities, status should be certified by employer

Objectives

- Engineering knowledge, training and experience appropriate to the process application;
- Engineering knowledge, training and experience appropriate to the applicable technology used (for example, electrical, electronic or programmable electronic);
- Engineering knowledge, training and experience appropriate to the sensors and final elements;
- Safety engineering knowledge (for example, process safety analysis);
- Knowledge of the legal and safety regulatory requirements;
- Adequate management and leadership skills appropriate to their role in safety life-cycle activities;
- Understanding of the potential consequence of an event;
- The safety integrity level of the safety instrumented functions;
- The novelty and complexity of the application and the technology

8942 Triconex Safety View Comprehensive

This hands-on instructor-led course will help improve plant availability and utilization by covering all aspects of Triconex Safety View®, which provides superior alarm and bypass management. Safety View® is the world’s first alarm and bypass management software to be TÜV-certified for use in up to SIL3 process safety applications. Safety View draws attention to changes in process conditions that require immediate attention, giving operators, maintenance engineers and shift personnel better visibility into the process so they can take actions that reduce risk, optimize total cost of ownership and increase overall asset performance. Safety View® process alarm function blocks allow configuration of the alarm sequence as defined in the ISA 18.1 Standard. It is a PC-based HMI dedicated to safety critical alarms and is independent of the control system. It also provides an alternative to traditional hard-wired alarm annunciator panels. It supports Invensys’ industry-leading family of Triconex safety instrumented systems: TRICON (SIL3), TRIDENT (SIL3) and Triconex General Purpose (SIL2) systems. Written exams and performance tests will validate student learning. (Course code 8942)

Duration: 3 days

Who Should Attend?

- Personnel responsible for performing ABM Safety View operations
Technicians responsible for acknowledging safety critical alarms
Plant Engineers responsible for managing Safety View system

Prerequisites
- Working knowledge of Microsoft Windows based operating systems
- Knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Completion of Invensys Learning courses 8902/8903
- Wonderware InTouch Courses Part I and II is strongly recommended prior to enrollment.

Objectives
- Describe key features of Triconex Safety View
- Identify TriStation 1131 application development steps
- Define Alarm Bypass and Bypass Function Blocks
- Configure Alarm and Bypass interfaces
- Declare and assign Tagname properties
- Import Tagname Alarm information
- Configure Safety View components
- Perform Alarm Bypass Management (ABM) maintenance functions such as:
  - Acknowledge individual and group alarms
  - Reactivate alarms acknowledged by an operator
- Reset alarms in the ring back state

8965 Triconex Trilogger Comprehensive
This hands-on instructor-led course will help improve plant availability. The 3-day Trilogger hands-on course provides detailed instruction and practical exercises for Trilogger interfaces and utilities. This intensive hands-on course will include classroom theory and practical exercises. An overview of TRICON configuration and the TriStation 1131 Developer’s workbench will be included in the course, before students begin to use the Trilogger features. The primary objectives of this course are to effectively use Trilogger modes to collect, analyze, and identify trending real-time control application data. After downloading the application to the TRICON controller, students will then use the Trilogger to identify, monitor, and analyze Tagnames from the program logic. Students will receive instructions, perform practical exercises, and must successfully complete practical and written exams in order to complete the course. (Course code 8965)
Duration: 3 Days

Who Should Attend?
- Supervisory personnel responsible for the Triconex system
- Technicians responsible for installing and maintaining the Triconex system
- Plant Engineers who configure and support the Triconex system

Prerequisites
- Working knowledge of Microsoft Windows operating systems
- Working knowledge of Programmable Logic Controllers (PLC’s) or Distributed Control Systems
- Familiar with basic electronics and maintenance procedures
- Invensys Learning course 8902 TRICON/TriStation 1131 Configuration course

Objectives
- Describe TRICON theory and configuration
- Navigate TriStation 1131 Developer’s Workbench
- Develop safety application program
- Use Trilogger Features
- Trilogger Event Mode
- Trilogger Playback Mode
- Trilogger Remote Mode
I/A Series System – Instructor-led Courses

2000 Introduction to Configuration version 6 and 7
This instructor-led course will help increase plant availability by establishing plant consistency of methods and applications. The course will enable plant engineering personnel to generate displays, build simple control loops, and understand general system diagnostic messages from a process and maintenance engineer’s perspective. Participants will learn to identify major hardware and software components of the I/A Series® system. Participants will also learn the mechanisms and priorities used in process alarm reporting and are able to enable and disable alarm reporting. This course also introduces the programming steps needed to access, and engineer the AIM*AT® suite of software applications. You will learn to manipulate data using mathematical functions. You will also practice configuring an AIM*AT server to retrieve data and reports into a Microsoft Excel® spreadsheet, or web-based application among other tasks. This hands-on course is designed to give you up-to-date information on creating, managing, and interrogating this sophisticated database. The classroom instruction and practical laboratory exercises will lay the groundwork for more advanced I/A Series courses. . This course is made up of Invensys Learning courses 2001 week 1 and 2004 week 2. (Course code 2000)

Duration: 10 Days

Prerequisites
• Working knowledge of personal computers and Microsoft Excel spreadsheet
• Minimum of six months experience using process control computers

Who should attend?
• Personnel responsible for configuration, maintenance for their I/A Series system and generating reports.
• Managers and engineers responsible for retrieving data on process or plant performance, or plant operations

Special Note
Inform the registrar if you are using the Display Manager or FoxView, ICC or IACC when you register

Objectives
• Identify basic hardware components of a typical I/A Series system, its functions, and interrelationships. Describe the function of an operating system and execute elementary commands on an I/A Series system to support maintenance tasks
• Use an I/A Series control configurator to construct and generate simple process control schemes.
• Use default displays to test the operation of control loops
• Operate FoxDraw™ to construct process displays that interact with live process data. Make on-line modifications to real-time and historical trend displays
• Configure and understand predefined alarm schemes
• Assign control block alarm events to Annunciator Keyboard LED’s and displays. Assign programs to Annunciator Keyboard push buttons
• Install the AIM*AT suite of software and perform the setup tasks in order to access data
• Operate the AIM*Historian® application to monitor various process variables
• Configure and utilize reduction groups
• Perform AIM*Historian archiving operations
• Access real-time and historical data
• Access real-time and historical data in graphical format
• Set up the Aim* ODBC driver and access data with the SQL select statement
• Use AIM*Historian utilities to access and modify instances
• Configure an instance to include both events activated by user-defined conditions and MDE values
• Configure and execute reports using the I/A Series® Report Package

2000v8 Introduction to Configuration version 8 and higher
This instructor-led course will help increase plant availability and utilization by establishing plant consistency of methods and applications. This course will enable plant engineering personnel to generate displays, build simple control loops, and understand general system diagnostic messages from a process and maintenance engineer’s perspective. Participants will learn to identify major hardware and software components of the I/A Series system version 8 and higher. Participants will also learn the mechanisms and priorities used in process alarm reporting and be able to enable and disable alarm reporting. This course also introduces the programming steps needed to access and engineer the AIM*AT suite of software applications. You will learn to manipulate data using mathematical functions. You will also practice configuring an AIM*AT server to retrieve data and reports into a Microsoft Excel spreadsheet, or web-based application among other tasks. This hands-on course is designed to give you up-to-date information on creating, managing, and interrogating this sophisticated database. The classroom instruction and practical laboratory exercises will lay the groundwork for more advanced I/A Series courses. This course is made up of Invensys Learning course 2001v8 week 1 and 2004 week 2. (Course code 2000v8)

Duration: 10 Days
Prerequisites:
- Working knowledge of personal computers and Microsoft Excel spreadsheet
- Minimum of six months experience using process control computers

Who should attend?
Personnel responsible for configuration, maintenance and generating reports from their I/A Series system version 8 and higher. Managers and engineers responsible for retrieving data on process or plant performance, or plant operations

Objectives:
- Identify basic hardware components of the I/A Series system MESH network, its functions, and interrelationships. Describe the function of an operating system and execute elementary commands on an I/A Series system to support maintenance tasks. Use an I/A Series control configurator to construct and generate simple process control schemes
- Use default displays to test the operation of control loops
- Operate FoxDraw™ to construct process display that interface with live process data. Make online modifications to real-time and historical trend displays
- Configure and understand predefined alarm schemes
- Assign control block alarm events to Annunciator Keyboard LED’s and displays. Assign programs to Annunciator Keyboard pushbuttons
- Install the AIM*AT suite of software and perform the setup tasks in order to access data
- Operate the AIM*Historian application to monitor various process variables
- Configure and utilize reduction groups
- Perform AIM*Historian archiving operations
- Access real-time and historical data
- Access real-time and historical data in graphical format
- Set up the AIM*ODBC driver and access data with the SQL select statement
- Access data using AIM*OPC using the tools embedded in the AIM suite.
- Use AIM*Inform to build and view HTML reports
- Use AIM*Historian utilities to access and modify instances
- Configure an instance to include both events activated by user-defined conditions and MDE values
- Configure and execute reports using the I/A Series Report Package
2001 Configuration Essentials version 6 and 7
This instructor-led course will help establish plant consistency of methods and applications by enabling plant engineering personnel to generate displays, build simple control loops, and understand general system diagnostic messages from a process and maintenance engineer’s perspective. Participants will learn to identify major hardware and software components of the I/A Series® system. Participants will also learn the mechanisms and priorities used in process alarm reporting and are able to enable and disable alarm reporting. The classroom instruction and practical laboratory exercises will lay the groundwork for more advanced I/A Series courses. (Course code 2001)

Duration: 5 Days

Prerequisites
- Working knowledge of personal computers
- Minimum of six months experience using process control computers

Who should attend?
Personnel responsible for configuration and maintenance of their I/A Series system

Special Note
Inform the registrar if you are using the Display Manager or FoxView, ICC or IACC when you register

Objectives
- Identify basic hardware components of a typical I/A Series system, its functions, and interrelationships. Describe the function of an operating system and execute elementary commands on an I/A Series system to support maintenance tasks
- Use an I/A Series control configurator to construct and generate simple process control schemes.
- Use default displays to test the operation of control loops
- Operate FoxDraw™ to construct process displays that interact with live process data. Make on-line modifications to real-time and historical trend displays
- Configure and understand predefined alarm schemes
- Assign control block alarm events to Annunciator Keyboard LED’s and displays. Assign programs to Annunciator Keyboard push buttons
2001v8 Configuration Essentials version 8 and higher
This instructor-led course will enable plant engineering personnel to identify major hardware and software components of the I/A Series® system. Participants will learn to generate displays, build simple control loops, and understand general system diagnostic messages from a process and maintenance engineer’s perspective. Participants will also learn the mechanisms and priorities used in process alarm reporting and be able to enable and disable alarm reporting. The classroom instruction and practical laboratory exercises will lay the groundwork for more advanced I/A Series courses. (Course code 2001v8)

Duration: 5 days

Who should attend?
Process Engineers responsible for configuration or software maintenance of their version 8 I/A Series system

Prerequisites
- Working knowledge of personal computers and plant processes
- Minimum of six months experience using process control computers

Objectives
- Identify basic hardware components of the I/A Series system MESH network, its functions, and interrelationships. Describe the function of an operating system and execute elementary commands on an I/A Series system to support maintenance tasks
- Demonstrate use of an I/A Series control configurator to construct and generate simple process control schemes.
- Demonstrate testing of control loops using default process displays
- Apply FoxDraw™ to construct process displays that interact with live process data. Make on-line modifications to real-time and historical trend displays
- Interpret results and demonstrate modification of predefined alarm schemes
- Assign control block alarm events to Annunciator Keyboard LEDs and displays. Assign programs to Annunciator Keyboard push-buttons
- Describe process of modifying the I/A Series system configuration
- Describe standard system diagnostic and support tools

2003 Advanced I/A Series Tools for UNIX servers
This instructor-led course will help you increase plant availability and effectiveness by optimizing the usage of key I/A Series system tools and configurators. It will also help you
protect plant intellectual assets and minimize the impact of unforeseen catastrophes through the usage of proper archiving and restoration of I/A Series system databases. You will be able to control access to key plant variables in graphic displays. You will also learn how to use powerful system utilities to access, change, and diagnose system and process variables. (Course code 2003)

**Duration:** 5 Days

**Prerequisites**
- Invensys learning course 2000 or 2001, Introduction to Configuration/Configuration Essentials
- Invensys Learning course 2400, Unix Software Technologies, or UNIX self-study Workshop, or equivalent UNIX experience

**Who should attend?**
Process Engineers responsible for configuration of their I/A Series system that want to optimize and control the use and availability of system and process information

**Objectives**
- Configure the execution of Display Manager Calls using various soft keys
- Utilize display utilities and Display Manager Variables to modify displays and limit access to graphics in FoxView software or the Display Manager
- Inhibit Process alarms at the compound and block level on command or a process event
- Use the Alarm/Display Manager Configurator to configure multiple display managers, associate
- Alarm Managers with display mangers, and customize Alarm Manager Configuration schemes
- Describe Object Manager concepts
- Use Object Manager utilities to access and manipulate the control database
- Use system tools and utilities to assist in the analysis and troubleshooting of I/A Series system

**2004 AIM*AT**
This instructor-led course helps increase plant utilization by introducing the programming steps needed to access, and engineer the AIM*AT® suite of software applications. You will learn to manipulate data using mathematical functions. You will also practice configuring an AIM*AT server to retrieve data and reports into a Microsoft Excel® spreadsheet, or web-based
application among other tasks. This hands-on course is designed to give you up-to-date information on creating, managing, and interrogating this sophisticated database. (Course code 2004)

**Duration:** 5 Days

**Prerequisites**
- Invensys learning course 2000 or 2001(v8), Introduction to Configuration/Configuration Essentials
- Familiarity with Microsoft Office®

**Who should attend?**
Managers and engineers responsible for retrieving data on process or plant performance, or plant operations

**Objectives**
- Describe the purpose and function of the AIM*AT suite of software
- Operate the AIM*Historian® application to monitor various process variables
- Configure and utilize reduction groups
- Perform AIM*Historian archiving operations
- Access real-time and historical data
- Access real-time and historical data in graphical format
- Set up the Aim* ODBC driver and access data with the SQL select statement
- Access data using AIM*OPC using the tools embedded in the AIM suite.
- Use AIM*Inform to build and view HTML reports
- Use AIM*Historian utilities to access and modify instances
- Configure an instance to include both events activated by user-defined conditions and MDE values
- Configure and execute reports using the I/A Series Report Package

2005 FoxView/FoxDraw version 6 or higher
This instructor-led course will help increase plant utilization and lower engineering cost through proper design, use and control of graphical displays for the I/A Series system. During this hands-on course is intended for customers moving from Display Manager (DM) to FoxView. You will learn to use FoxView to interact with real-time and historical plant, field, and process data available in the I/A Series system. You will also learn to design, create, and edit operator and
engineering displays, using the FoxDraw™ graphical display editor and convert DM files to FoxDraw files. (Course code 2005)

**Duration:** 3 Days

**Prerequisites**
- Invensys learning course 2000 or 2001, Introduction to Configuration/Configuration Essentials (Note: you need not attend this course if the course 2000 or 2001 course you attended included FoxView/FoxDraw)
- Working knowledge of computers

**Who should attend?**
Process Control Engineers and technicians who are responsible for building or maintaining FoxDraw displays and the process operator’s human interface environment

**Objectives**
- Convert existing Display Manager displays to FoxDraw displays
- Verify control block function by using FoxView and FoxSelect software to call up block detail displays
- Build or enhance a process display using FoxDraw software
- Configure basic control dynamics in a process display using FoxDraw and verify its function using FoxView
- Restrict display and Configuration access using FoxView Environment configuration editor
- Trend and plot process values
- Reduce engineering efforts using advanced FoxDraw features such as custom symbols and aliases

**2007 System Administration for Windows**
This instructor-led course will help you increase plant availability and effectiveness by making familiar Windows Administration requirements and key system tools and configurators. It will also help you protect plant intellectual assets from security threats and minimize the impact of unforeseen system outages through the usage of proper setup, backup, and restoration of workstations. This course will also outline the basic steps needed to setup and install the mesh network. You will be able to complete the full install process for both new and updated configuration changes. You will learn to view and modify files that affect the operation of your I/A Series workstation. You will be able to control access to key plant variables in graphic
You will also learn how to use windows and system utilities to access, change, and diagnose system and process variables using available documentation to complete tasks. (Course code 2007)

**Duration:** 5 days

**Prerequisites**
- Invensys Learning course 2000 or 2001, 5000 or 5001
- Invensys Learning course 2101, Continuous Control

**Who should attend?**
- Process engineers responsible for configuration and administration who want to optimize uptime the use and availability of system and process information

**Objectives**
- Use Foxboro Electronic Documentation
- Configure the McAfee setup, installing of new virus definitions, and exclusion lists
- Review Microsoft Security Patch requirements for the windows workstations and procedure required to update the Security Patches on your system
- Configure the mesh using both the Mesh Configurator utility
- Create install commit diskette and install software in a new system
- Modify the installed software and install software on an existing system using the System Definition software
- Review files that get modified during a software install
- Review, edit files that will change the start-up of a windows station
- Configure the execution of Display Manager Calls using various soft keys
- Utilize display utilities and Display Manager variables to modify displays and limit access to graphics in FoxView software or the Display Manager
- Use the Alarm/Display Manager Configurator to configure multiple display managers, associate Alarm Managers with Display managers, and customize Alarm Manager Configuration schemes
- Review Microsoft tools to license terminal server sessions and create users for terminal server sessions
- Use the Backup Exec System Recovery console to backup and restore a windows I/A Station
2008 I/A System Security Administration

This instructor-led workshop is directed at plant engineers with system security responsibilities or background. This workshop will introduce attendees to basic definitions, components, and protocols of the major applications and architectures within critical infrastructure (CI) and key resources (KR) of the I/A Series system architecture at I/A series version 8.5. The workshop will focus on solutions aimed at preventing unauthorized use of the systems that use I/A Series Secure system. The workshop will also identify mitigations available in the system to prevent vulnerabilities and ways to prevent and detect intrusions. (Course code 2008)

Duration: 3 days

Prerequisites

- Invensys Learning course 2000 or 2001, Introduction to Configuration/Configuration Essentials, 5000 or 5001 FCS Essentials
- Experience in critical infrastructure control systems and their relationship to modern IT networks.
- At least one year experience in Process Control system Administration

Who should attend?
Plant engineers with I/A Series system security responsibilities and background

Objectives

- Describe key enhancements contained in I/A Series System Software version 8.5 and above.
- Describe the system architectures required to create a secure system.
- Manage a Primary Domain Controller (PDC). Add users to organizational Units. Modify Group Policy Objects and add users to organizational units.
- Describe the concept of an Active Directory and how it is used for I/A Security.
- Describe the Difference between Organizational Units (OU) and Security Groups.
- Use Troubleshooting tools for Group Policy Issues.
- Describe the installation of a I/A Series as a secured system
- Describe the relationship between the System Manager Service and the System Manager Client
- Use all functions in the Station Assessment Tool (SAT).
- Enable, and modify all portions of the McAfee ePolicy Orchestrator (ePO)
- Use the McAfee ePO Console, to view station information
- Knowledge of the Host Intrusion feature to test for system intrusions
- Use the Device Control feature to disable devices per user
• Create client tasks to configure more functions in McAfee ePO
• Use McAfee ePO to update McAfee DAT file to all clients.
• Describe the new features of FCS as well as what needs to be addressed in a secure installation of an FCS

2009 Advanced System Administration
This instructor-led course will help increase plant availability and effectiveness by introducing the participant to the tools and techniques used by a system administrator responsible for a Windows based systems. This course uses system tools to view system functionality. This course will look at the Object Manager connections, IPC connections, Tools that allow the viewing of I/A interactions between Operator Stations, CP’s, Historians, 3rd Party data collection packages. View Control Processor usage and be able to determine better control sizing. Tools to view displays and how to change displays connections. Lessons will concentrate on writing scripts in the Mortis Korn Shell scripting capabilities on the Windows System. This course will look at FoxApi, AIMAPI functions available in these products. (Course code 2009)

Duration: 5 days

Prerequisites
• Invensys Learning course 2000v8, 2001v8, or 5000 and 5001
• Invensys Learning course 2101, Continuous Control
• Invensys Learning course 2007, I/A Windows Administration

Who should attend?
Process engineers responsible for configuration and administration of a Microsoft Windows based I/A Series system

Objectives
• List Mortis Korn Shell (MKS) commands
• Use scripts in MKS
• Schedule MKS scripts and other MKS utilities.
• Use tools to view and report Object Manager Connections
• Use tools to view and report IPC Connections
• Set up and understand the use of Object Manager Multicast Optimization (OMMO)
• Use tools to view Control Processor usage and files.
• Describe the usage of Compound Summary Access
• Describe features use in Device Monitor
• Describe and use features and tools of FoxDraw.
• Troubleshoot Problems with third party utilities
• List and review FoxAPI and AIMAPI utilities

2100 Integrated Control
This instructor-led course will help you increase plant availability and utilization by making familiar the procedures and processes for designing control databases using I/A Series® system process control configurators. This course focuses on parameters and algorithms required for continuous control applications, such as cascade, ratio, feedforward, and adaptive control loops. Included in the course are procedures for executing real-time complex mathematical calculations at the loop level. Fail-safe strategies and procedures are also discussed in this course. This course also makes familiar the procedures and processes for designing sequence and ladder logic programs using I/A Series system process control configurators. These programs are typically used to automate the start-up or shutdown of a process as well as in batch processes. You will build and test ladder logic control schemes and learn to build sequential control schemes, using the High Level Batch Language. The course includes extensive laboratory sessions to allow participants to both practice and test procedures learned. This course is made up of of Invensys Learning course 2101 week 1 and 2101 week 2. (Course code 2100)

Duration: 10 Days

Prerequisites
• Invensys Learning course 2000 or 2001, Introduction to Configuration/Configuration Essentials
• Invensys Learning course 6211, Process Control Technology or equivalent knowledge

Who should attend?
Control and Process Control engineers and technicians responsible for the design, installation, testing, or maintenance of control schemes using an I/A Series system should attend this course

Objectives
• Utilize control block parameters to construct and verify the operation of cascade, feedforward, ratio, multiple output, and discrete control schemes
• Employ the use of control parameters to enable output tracking, alarm filtering, and loop initialization
• Configure Fieldbus modules for desired fail-safe operation and measurement resolution
• Implement complex real-time calculations in control loops using advanced calculation blocks
• Employ I/A Series PIDA, FBTUNE, and other control blocks to configure and test adaptive control schemes
• Understand the use of the different types of control algorithms available in the I/A Series system
• Describe the functions of sequence control blocks and how they interact with each other
• Operate, configure, and program the Monitor and Timer, Independent, Dependent, and Exception sequence blocks
• Use Preprocessor Commands in conjunction with Macros and Include Files
• Program and test subroutines and Standard Block Exception Handlers
• Use the Sequence Function Chart software to program sequence control blocks
• Employ the PLB block, and other control blocks, to configure and test ladder logic control strategy

2101 Continuous Control
This instructor-led course will help you increase plant availability and utilization by making familiar the procedures and processes for designing control databases using I/A Series system process control configurators. This course focuses on parameters and algorithms required for continuous control applications, such as cascade, ratio, feedforward, and adaptive control loops. Included in the course are procedures for executing real-time complex mathematical calculations at the loop level. Fail-safe strategies and procedures are also discussed in this course. The course includes extensive laboratory sessions to allow participants to both practice and test procedures learned. (Course code 2101)

Duration: 5 Days

Prerequisites
• Invensys Learning course 2000 or 2001, Introduction to Configuration/Configuration Essentials
• Invensys Learning course 6211, Process Control Technology or equivalent knowledge
• Understand the workings of the ICC or IACC

Who should attend?
Control and Process Control engineers and technicians responsible for the design, installation, testing, or maintenance of control schemes using an I/A Series system should attend this course
Objectives
• Utilize control block parameters to construct and verify the operation of cascade, feedforward, ratio, multiple output, and discrete control schemes
• Employ the use of control parameters to enable output tracking, alarm filtering, and loop initialization
• Configure Fieldbus modules for desired fail-safe operation and measurement resolution
• Implement complex real-time calculations in control loops using advanced calculation blocks
• Employ I/A Series PIDA, FBTUNE, and other control blocks to configure and test adaptive control schemes
• Understand the use of the different types of control algorithms available in the I/A Series system

2102 Sequence control & Ladder Logic
This instructor-led course will help you increase plant availability and utilization by making familiar the procedures and processes for designing sequence and ladder logic programs using I/A Series system process control configurators. These programs are typically used to automate the start-up or shutdown of a process as well as in batch processes. You will build and test ladder logic control schemes and learn to build sequential control schemes, using the High Level Batch Language. The course includes extensive laboratory sessions to allow participants to both practice and test procedures. (Course code 2102)

Duration: 5 Days

Prerequisites
• Invensys Learning course 2000 or 2001, Introduction to Configuration/Configuration Essentials
• Invensys Learning course 2101, Continuous Control
• of Invensys Learning course 6211, Process Control Technology or equivalent knowledge
• Understand the workings of ICC and/or IACC

Who should attend?
Control and Process Control engineers and technicians responsible for the design, installation, testing, or maintenance of control schemes using an I/A Series system
Objectives

- Describe the functions of sequence control blocks and how they interact with each other
- Operate, configure, and program the Monitor and Timer, Independent, Dependent, and Exception sequence blocks
- Use Preprocessor Commands in conjunction with Macros and Include Files
- Program and test subroutines and Standard Block Exception Handlers
- Use the Sequence Function Chart software to program sequence control blocks
- Employ the s PLB block, and other control blocks, to configure and test ladder logic control strategy

2103 Advanced system block configuration

This instructor-led workshop will help you become proficient in implementing plant control schemes using Series control continuous control blocks by making familiar the usage of control blocks and their parameters in simple and complex applications. This course focuses on parameters and algorithms required for continuous control applications, such as cascade, ratio, feedforward, ratio and adaptive control loops. The content of the workshop can be applied to any I/A series or Foxboro Evo System. It includes extensive laboratory sessions to allow participants to both create and discuss best practices in using control blocks. (Course code 2103)

Duration: 5 days

Who should attend?

- Plant application engineers responsible for the design, installation, testing, or maintenance of control schemes using a Foxboro Evo System or I/A Series system.

Prerequisites

- Invensys Learning course 2000 or 2001,5001 or 5000
- Invensys Learning course 6211, Process Control Technology or equivalent knowledge
- At least one year experience in using and configuring Foxboro control blocks

Objectives

- Describe the dynamic elements in a control loop, characteristics of real process and the use of linear and non-linear controllers
- Describe what makes control loops behave as they do
- Describe what determines how well a given variable can be controlled
• Describe the characteristics of a real process
• Describe the use of linear and non-linear controllers in a control loop
• Discuss and demonstrate proper configuration of key parameters of the following input blocks
  o AIN block
  o CIN Block
  o AINR block

• Discuss and demonstrate proper configuration of key parameters of the following output blocks
  o AOUT block
  o OUTSEL block
  o COUT block
  o VLV Block
  o MOVLV block
  o MTR block
  o GDEV block

• Discuss and demonstrate proper configuration of key blocks and block parameters when configuring a single loop
• Show proper configuration of control block parameters in a standard loop structure
• Show proper configuration of control block parameters for basic control functions
• Show proper configuration of control block parameters for mode control and initialization
• Show proper configuration of control blocks parameters for the advanced functions in a PIDA control block
• Discuss and demonstrate proper configuration of key blocks and block parameters for a loop with adaptive tuning capability with the following behaviors:
  • Provide control stability as conditions change
  • Limit the range of the allowable tuning constants
  • Alarm the operator if the loop breaks into an oscillation
  • Transfer the controller into manual if the oscillation exceeds a specified amplitude
  • Discuss and demonstrate proper configuration of key I/A series blocks and block parameters for a standard cascade control scheme with the following constraints using a heat exchanger as an example:
    • Integrate a control loop that will regulate flow directly and prevent upsets in the steam header from changing heat transfer.
    • Maintain a minimum steam flow to the heat exchanger.
• Maintain effective temperature control by limiting the feed rate to the downstream unit as necessary.
• Discuss and demonstrate proper configuration of key blocks and block parameters in a typical ratio control scheme to:
• Reduce the amount of off-specification product by automatically adjusting the additive flow when the production rate increases
• Allow the operator to adjust the amount of the additive ingredient per unit of product, within bounded limits.
• Maintain feedback correction of the product composition.
• Limit the production flow rate when insufficient additive is available.
• Alarm the operator if the product is not within specification limits
• Discuss and demonstrate proper configuration of key blocks and block parameters of a basic feedforward control scheme for the following behaviors using a heat exchanger as an example:
• Immediately adjust the flow rate of the steam flow set point whenever either the flow or temperature of the water inlet changes.
• Provide feedback correction of any steady-state errors in the discharge temperature
• Provide a back-calculated output for the feedback trim controller
• Include a dynamic function for temporary correction of transient errors
• Minimize the number of blocks used in the scheme
• Compensate the effect of variable steam pressure in the steam supply header
• Allow the operator to switch back to conventional cascade control
• Discuss and demonstrate proper configuration of key blocks and block parameters of an override control scheme without using selector blocks using a distillation column as an example:
• Maintain a minimum flow through the pump, or shut it down
• Limit the amount of heat input to the re-boiler to keep the level from falling below an acceptable minimum.
• Limit the feed rate to the column so as to avoid flooding the column with liquid

2200 Equipment Maintenance version 6 and 7
This instructor-led course will help increase plant availability and reduce corrective and preventive maintenance cost by making familiar diagnostic and problem-solving procedures through lab exercises using I/A Series system hardware and software. The course will also help you identify all the essential hardware and software components of the I/A Series system and verify its proper installation. (Course code 2200)
Duration: 5 Days

Prerequisites
- Working knowledge of personal computers
- Prior experience with digital process control equipment

Who should attend?
Technicians responsible for maintenance of I/A Series systems

Objectives
- List the basic hardware components of a typical I/A Series system, their functions and interrelationships. Differentiate between the types and number of industrial power modules necessary to satisfy different power configurations
- Follow documented procedures to verify proper system installation
- For a given I/A Series system, which includes fault-tolerant stations, identify each module and peripheral device, trace all bus and cable connections, and demonstrate proper removal and replacement procedures
- Using FoxView software, demonstrate the methods of accessing environments, displays, and I/A Series configurators, and describe their purpose
- Operate the system management displays to access status, configuration, and fault analysis information related to an I/A Series system network, individual modules, and peripheral devices
- Utilize documentation and proper troubleshooting techniques to resolve hardware problems

2200v8 Equipment Maintenance version 8 and higher
This instructor-led course will help increase plant availability and reduce corrective and preventive maintenance cost by making familiar diagnostic and problem-solving procedures through lab exercises using I/A Series® system hardware and software version 8.0 and higher.. The course will also help you identify all the essential hardware and software components of the I/A Series system and verify its proper installation. (Course code 2200v8)

Duration 5 Days

Who should attend?
Technicians responsible for maintenance of I/A Series systems version 8
Prerequisites

• Working knowledge of personal computers
• Prior experience with digital process control equipment

Objectives

• List the basic hardware components of an I/A Series system: the MESH network, station on the network, their functions and interrelationships
• Follow documented procedures to verify proper system installation
• For a given I/A Series system, which includes fault-tolerant stations, identify each module and peripheral device, trace all bus and cable connections, and demonstrate proper removal and replacement procedures
• Demonstrate the procedures required to replace a MESH switch
• Using FoxView™ software, demonstrate the methods of accessing environments, displays, and I/A Series configurators, and describe their purpose
• Describe how power is distributed to Fieldbus modules and Control Processors
• Operate system management displays to access status, configuration, and fault analysis information related to an I/A Series system network, individual modules, and peripheral devices
• Operate system management displays to update firmware of I/A Series system stations and peripherals
• Utilize documentation and proper troubleshooting techniques to resolve hardware problems

2210 System & Software Maintenance version 6 and 7
This instructor-led course will help increase plant reliability and reduce corrective and preventive maintenance cost by making familiar procedures to test and identify I/O problems encountered during hardware and software installation, system modification, and ongoing maintenance. It will also help protect plant intellectual assets and minimize the impact of unforeseen catastrophes through the usage of proper archiving and restoration of I/A Series system files and databases. Laboratory exercises will reinforce the procedures taught in the use of system diagnostic tools and procedures and in identifying field problems in control loops. (Course code 2210)

Duration: 5 Days

Prerequisites

• Working knowledge of personal computers
• Prior experience with digital process control equipment
• Invensys Learning course 2200, Equipment Maintenance

Who should attend?
Technicians who are responsible for system backup and restore procedures, and testing communications between I/A Series equipment and I/O devices

Objectives
• Use basic operating system commands to support maintenance tasks
• Perform system backup and restoration procedures on system servers
• Construct a continuous control loop to monitor and control a process
• Incorporate alarming parameters into a control loop
• Utilize default displays to monitor and control a process
• Utilize a ladder logic application to control and test discrete devices
• Employ discrete control blocks to test devices

2210v8 System & Software Maintenance version 8 and higher
This instructor-led course will help increase plant availability and reduce corrective and preventive maintenance cost by making familiar procedures to test and identify I/O problems encountered during hardware and software installation, system modification, and ongoing maintenance. It will also help protect plant intellectual assets and minimize the impact of unforeseen catastrophes through the usage of proper archiving and restoration of version 8 I/A Series® system files and databases. Laboratory exercises will reinforce the procedures taught in the use of system diagnostic tools and procedures and in identifying field problems in control loops. (Course code 2210v8)

Duration: 5 days

Who should attend?
Technicians who are responsible for system backup and restore procedures, and testing communications between version 8 I/A Series equipment and I/O devices

Prerequisites:
• Working knowledge of personal computers
• Prior experience with digital process control equipment
• Invensys Learning course 2200v8, Equipment Maintenance version 8
Objectives:
- Use basic operating system commands to support maintenance tasks
- Perform system backup and restoration procedures on system servers
- Construct a continuous control loop to monitor and control a process
- Incorporate alarming parameters into a control loop
- Utilize default displays to monitor and control a process
- Utilize a ladder logic application to control and test discrete devices
- Employ discrete control blocks to test devices

2211 MESH Configuration & Maintenance Workshop
This instructor-led workshop will help you increase plant availability and reliability by providing an understanding of the tools and key concepts used the selection, configuration and support of the MESH network. MESH Definitions and topologies will be discussed along with the usage of the Internet Protocol Suite (commonly known as TCP/IP) in the MESH. Additional topics discussed are the used of virtual LANs, commonly known as a VLAN, the I/A Series COMEX (communication executive). Participants will also be introduced to the Invensys Switch configuration tool used for switch diagnostics and repair and the Enterasys NetSight console used for verifying network health and network diagnostics. (Course code 2211)

Duration: 3 days

Who should attend?
- Personnel responsible control system administration
- Personnel responsible for plant control networks

Prerequisites
- Familiarity with I/A Series or Foxboro Evo System hardware and software
- Invensys Learning course 2001 or 5001 recommended
- Invensys Learning course 2200 or 5200 recommended

Objectives
- Describe MESH requirements Legacy IA, Requirements, Topology, Enterasys Switches, Configuration
- Describe tools and techniques used in MESH Diagnostics
• Describe good practices when installing and using and maintaining the Foxboro I/A Series MESH network.
• Use the Switch Configurator Software Application (SCAS) to verify configure various switch configurations and validate switch settings.
• Understand the diagnostic tools available on an I/A system to find problems with the Mesh.
• Describe the Enterasys NetSight console and its use with the MESH Network

2220 I/A Series System FDSI with Modbus
This instructor-led course will help maintenance and project engineers successfully install and commission the majority of communication linkages between Modbus devices and the I/A Series or Foxboro Evo System using FDSI modules. The course will cover:
• The Installation of cables and connections required to enable Modbus devices to communicate with the I/A Series system through FDSIs
• Verification of correct installation of cables and connections.
• Verification of communication between Modbus device(s) and the I/A Series system with a test database
• Troubleshooting and correction of common problems that impede communication between the Modbus Device(s) and the I/A Series System (Course code 2220)

Duration: 3 days

Who should attend?
• Project and maintenance engineers responsible for supporting or installing I/A Series or Foxboro Evo Systems

Prerequisites
• Invensys Learning course 2001v8 or 5001
• One year project engineering or maintenance experience

Objectives
• Identify FDSI Modules
• Create an FDSI Network topology
• Connect FDSI cabling
• Wire FDSI Terminal Assemblies
• Connect RS232 serial cabling
• Connect RS485 serial cabling
• Setup Redundant Serial FDSI’s
- Setup Redundant Ethernet FDSI’s
- Install FDSI hardware
- Make FDSI cable connections
- Utilize 3rd Party Modbus Emulators
- Use Sniff Cables to monitor communications
- Use Tap Devices to monitor communications
- Follow Steps of Integration Process
- Install FDSI Driver
- Generate Configuration Files
- Create and Configure ECB’s
- Create and Configure DC1 Blocks
- Detail the Modbus protocol
- Use Block Detail Displays
- Use Faceplates
- Maintain FDSI using System Manager
- Interpret LED Indicators for each FDSI module
- Employ FDSI Diagnostics
- Recognize loss of Communications
- Employ Error Handling
- Examine possible problems
- Configure an I/A system to communicate with 3rd party Modbus device through FDSI

2221 Field Device Integration with OPC
This instructor-led course will enable plant engineering personnel to apply the Field System Device Integrator using the OPC client driver. The classroom instruction and practical laboratory exercises will lay the groundwork for connecting to plant floor devices via an OPC server. (Course code 2221)

Duration: 3 days

Who should attend?
- Process Engineers responsible for integration of version 8 I/A Series system control database and factory floor devices using OPC protocol

Prerequisites
- Working knowledge networks using Ethernet
- General knowledge of the control database structure such as letterbugs ECB’s etc.
• Concept of client/server applications

Objectives
• Describe common hardware and software components of a MESH system
• Describe current OPC standards
• Install FDSI Hardware with OPC client driver
  o Install FBM 233 used to facilitate the OPC FDSI
  o Connect the FBM 233 to an OPC server.
  o Describe other FBM hardware that can be used to as an OPC interface
• Configure FDSI with OPC client driver
  o Build the ECB’s to provide software support to the FBM233.
  o Create the XML support files needed by the OPC driver.
  o Create the control blocks to integrate OPC device data into an I/A system
• Troubleshoot FDSI using the OPC client driver
  o Use the System Manager to determine the health of the FDSI
  o Put the interface online
  o Assess the health of the FBM233 and OPC using System Manager and device LED’s
  o Use the FDSI diagnostic tool to test communication

2300v8 Process Operations version 8 and higher
In this instructor-led course will help improve plant utilization through establishing consistency in operating plant controls and by allowing plant staff to gain the background necessary to perform procedures normally encountered by a process operator in the control room. Through a series of simulated control schemes, you will learn the mechanics of operating the version 8 I/A Series system user interface by interacting with typical process displays. (Course code 2300v8)

Duration: 3 Days

Prerequisites
• Previous control room experience using pneumatic, electronic, or digital systems

Who should attend?
Control room operators, supervisors, and process engineers who are responsible for day-to-day operations in the plant
Objectives

• Use the devices provided by the operator’s workstation to access displays, overlays, and environments and to determine which variables are operator changeable
• Given a typical process situation, recognize the occurrence of a process alarm, determine its cause, and provide appropriate response
• Operate the standard Foxboro I/A Series faceplate displays and custom graphic displays
• Use the features of real-time trends to observe variations in process conditions and review historical data
• Demonstrate the method of access and the information presented in I/A Series operational reports and in scheduled and on-demand custom process reports
• In the event of a failure, acknowledge the system alarm, and identify the failed I/A Series component.

2610 FoxCAE
This instructor-led course will help you increase productivity and reduce engineering for I/A Series control stations and I/A Series historians using FoxCAE v5.0 software. Forward engineering, loop documentation, and back documentation are some of the benefits to be realized with this course. You will be able to implement control schemes off-line and on-line in the I/A Series system. You will also learn how to use the powerful importing and propagation tools to populate field device databases. Forward engineering instrument databases will help you increase engineering productivity and help eliminate configuration errors. (Course code 2610)

Duration: 3 days

Prerequisites

• Invensys Learning course 2000 or 2001, Introduction to Configuration/Configuration Essentials
• Invensys Learning course 2100 or 2101, Integrated Process Control, or Continuous Control
• Working knowledge of personal computers in a Microsoft® Windows environment

Who should attend?
Process control engineers who will use FoxCAE software to configure, document, and secure I/A Series control databases
Objectives

- Access the various FoxCAE components and describe their functions
- Utilize the basic Working Area windows, and graphical editor, to create a simple loop
- Utilize FoxCAE functions to manage a Project Database, manipulate a Tag List to import data, and set up various block propagation
- Manipulate Data-forms to map data for Block propagation schemes, and create and modify block structure defaults. Create and modify typical loop structures for bulk generation of a control scheme. Manipulate a FoxCAE control database for downloading into a Control Processor
- Load an existing CP database onto FoxCAE software and organize the compounds and blocks into control loops for documentation and control database maintenance

2612 I/A Series Configuration Component (IACC)

This instructor-led course will help you increase plant utilization, reduce engineering, and establish consistency of methods for I/A Series control stations, hardware, software and displays using IACC. In this course you will learn to use Control Strategy Diagrams (CSD’s) to create a control strategy. You will also learn to use Animated Loop Drawings (ALD’s) that is a new mode of the CSD Editor in which live data values from a running I/A Series system are displayed. IACC has improved import with merge capability, which has been expanded to allow an import/merge of all control object types. You will learn to use IACC Bulk functionality, which permits users to upload selected parameters from a CP to IACC across many compounds and blocks in a single action. You will integrate control loops with FoxDraw displays. You will also learn how to define system hardware and accompanying software parameters. You will learn to make the bulk generation and edits of control loops. (Course code 2612)

Duration: 5 Days

Prerequisites

- Invensys Learning course 2000 or 2001, Introduction to Configuration/Configuration Essentials
- Invensys Learning course 2100 or 2101, Integrated Process Control /Continuous Control

Who should attend?

Process control engineers, who will use IACC to create, edit, document, and secure I/A Series control databases, displays, and the I/A Series platform.
Objectives

- Build a simple loop using the Control Strategy Diagram Editor, assign it to a compound, and download it to a control station
- Create and edit FoxDraw displays from within IACC
- Given a Tag List, build a CSD Template and Bulk Generate multiple compounds and CSD’s from a tag-list and CSD Template
- Apply Ladder Logic control using the IACC interface
- Apply Sequential control using the IACC interface
- Build a system configuration, define the hardware naming and software parameters, validate it, and create a commit disk
- Describe and use the various security, multi-user, and version control features of IACC
- Use the Find in Database and Where Used search commands, as well as generate a report
- Backup, restore and verify IACC databases

2625 I/A Series Batch
This instructor-led course will help you increase productivity, reduce engineering, and establish consistency of methods with batch processing using the I/A Series System. You will construct a batch model based on a plant physical model and Functional Specification, then run and report on the batch recipes you have created. You will optimize the performance of the batch control strategy using recipe phases. (Course code 2625).

Duration: 5 days

Who should attend?
Process and control system engineers responsible for coordinating, implementing, or maintaining the I/A Series Batch

Prerequisites:
- Invensys Learning course 2000 Introduction to Configuration, or 2001 Configuration Essentials.
- Invensys Learning course 2100 Integrated Control, or 2101 Continuous Control and 2102 Sequence Control and Ladder Logic

Objectives
Given a process model, define the units, connections, and phases required to implement the batch control strategy.

- Declare a process block connection to the Batch System
• Create simple macros and tie block to the Batch System
• Define Flexible Batch and develop a good understanding of Flexible Batch characteristics.
• Define and build a process model with the following components: Units, Process Classes, Tags and Formula Parameters, Equipment Status.
• Link a process model to a control strategy.
• Map the process states defined in a Functional Design Specification into the sequence block states.
• Program sequence blocks so that the batch interface can be used effectively and the control strategy can be easily maintained.
• Create batch recipes, modify and build transition logic
• Schedule, run and test recipes

2652 FOUNDATION Fieldbus System Engineering with IACC
This hands-on, instructor-led course will help improve plant availability and reliability by making familiar the concepts, tools, and tasks required to engineer and integrate FOUNDATION Fieldbus devices with an I/A Series® system. Participants will become acquainted with segment design, importing DD files, and installing a DTM. Participants will create new device type templates and set security privileges and default parameter values. Participants will also create derived device type templates, create and configure device instances, associate device instances with an FBM/channel, and set FBM parameters. (Course code 2652)

Duration: 5 days

Who should attend?
Engineers who need to design FOUNDATION Fieldbus segments, configure and integrate FOUNDATION fieldbus devices with an I/A Series® system.

Prerequisites
• Invensys Learning course 2001v8, Configuration Essentials (recommended)
• Invensys Learning course 2612, IACC (recommended)

Objectives
• Describe “publish and subscribe” and client server communication methods
• Describe FOUNDATION Fieldbus loading and sizing rules and best practices
• Describe the function and link master block schedules
• Describe the I/A Series macrocycle implementation
• Describe LAS responsibilities
• Use Foundation Fieldbus Device Templates in IACC.
• Customize download/upload behavior and FDM tabs & viewing screens in IACC.
• Link manuals and other documentation in IACC.
• Set up security by privileges and user roles in IACC.
• Use inheritance functions in IACC.
• Configure the function block in IACC.
• Use the Field Device Manager to commission, replace, and troubleshoot devices

2700 Management Overview
This instructor-led course will help you increase plant utilization by providing you an overview of capabilities and major components of the I/A Series system. You will review hardware, control strategies, and I/A Series software packages and their features. This increased system comprehension will help you make better-informed day-to-day plant decisions. (Course code 2700)

Duration: 3 days

Who should attend?
Plant supervisors, managers, supply chain staff that have indirect responsibilities or connection with the I/A Series system

Prerequisites
• Familiarity with computer systems and process control

Objectives
• List the major hardware components of an I/A Series System, their functions, and interrelationships
• List the available software that Invensys offers as the Enterprise Control System
• Demonstrate the method of accessing environments, displays, and I/A Series configurators, and describe the purpose of these configurators
• Describe and manipulate predefined process control schemes consisting of I/A Series continuous block types
• Describe and recognize the occurrence of a process alarm
• Identify a failed component
• Describe the information presented in standard and custom process reports
• Use I/A Series trend displays and trending software packages to view real-time and historical data
• Describe how the I/A Series Control configurators are used to modify and document a predefined system configuration

2801 SCD2200 Configuration Essentials
This instructor-led course will help increase utilization and performance by generating a sound foundation of the hardware, software, and diagnostic features of the I/A Series SCD2200 Remote Telemetry Unit (RTU). This course covers the firmware and drivers needed for the SCD2200, and the key points for designing and operating the SCD2200. The participant will become familiar with the features and functions of FoxRTU Station, including diagnostics, utilities, the Dictionary, and event logging. This includes advanced configuration procedures for FoxRTU Station and the procedures for performing FoxRTU functions in ISaGRAF. (Course code 2801)

Duration: 5 days

Who should attend?
Personnel responsible for configuration and maintenance of the Foxboro SCD2200

Prerequisites
• Familiarity with computer applications and networking

Objectives
• Describe key supervisory control and data acquisition (SCADA) concepts
• List hardware, software, and diagnostic features of the Foxboro SCD2200 Remote Telemetry Unit (RTU),
• List the firmware and drivers needed for the SCD2200,
• Describe key points for designing and operating the SCD2200.
• Describe the features and functions of FoxRTU Station, including diagnostics, utilities, the Dictionary, and event logging.
• Describe the advanced configuration procedures for FoxRTU Station and the procedures for performing FoxRTU functions in ISaGRAF
• Describe the process of implementing redundancy
• Describe basic troubleshooting the SCD2200 RTU procedures by performing software diagnostic functions
Describe the procedures for interfacing the SCD2200 to an I/A Series system FBM233 through a DNP3 driver
Process Instrumentation and Control Instructor-led Courses

6321 Measurement Principles for Technicians
This instructor-led course will help increase plant availability and utilization while reducing plant corrective and preventive maintenance cost by making familiar the general principles behind the operation of plant sensing elements: flow, pressure, temperature, level, and electrochemical. This hands-on course will require you to put to use what you learned in detecting improperly operating equipment, determining which primary or secondary sensing element is the cause of field problems. This course will prepare you for more advanced courses in troubleshooting, calibration, and selection. The course material is not tied to any specific vendor equipment. Throughout all exercises, you will apply field-proven problem-solving models and learn basic plant safety procedures related to the handling, installation, and replacement of measurement equipment. (Course code 6321)

Duration: 5 Days

Prerequisite
- Successfully completed high school education

Who should attend?
Instrumentation technicians or others who require knowledge of primary measurement fundamentals in their work should attend this course. Novices will gain an understanding of the fundamentals of sensing devices; more experienced technicians will fill in gaps in fundamental knowledge and skills

Objectives
- Detect improper operation of various sensing elements used in process control loop environments. Visual inspection and selecting the proper test equipment to verify proper operation
- Using knowledge of basic principles to determine conditions that cause faults or measurement errors in a variety of liquid level measuring applications
- Determine measurement errors in flow measuring applications
- Using principles of different temperature sensing methods identify the likely causes of temperature measurement errors and eliminate them.
- Combine the knowledge of electrochemical measurement principles and related sensors; perform test procedures to identify potential problems in obtaining valid measurements and matching corrective actions
- Using pneumatic, electronic and digital transmission principles, identify the major factors likely to cause transmission errors or failures
6211 Process Control Technology
This instructor-led course will help increase plant availability, utilization and performance by generating a sound foundation of process control principles and theories. The course gives emphasis to fundamentals as well as practical application. It will provide a fuller appreciation of what can be expected when control strategies are applied and integrated to processes and their limits. The essential properties of a control loop are explained to provide you with a process control foundation. The course material is not tied to any specific vendor equipment. You may use this course as an independent overview of process control or as part of a continuing program in process control education. (Course code 6211, formerly 8211)

Duration: 5 Days

Prerequisites
- Six months of experience working with plant instrumentation and controls or successful completion of Invensys Learning course 6212, Process Measurement Technology, or the equivalent

Who Should Attend?
Persons with loop servicing responsibilities should attend this course. The course has been prepared with the “non-specialist” engineer or technician in mind. This course is also recommended for supervisors and managers and other individuals whose responsibilities are indirectly related to process control

Objectives
- Explain basic feedback control loops utilizing transmitters, controllers, and valves
- Sketch a controller’s output for step and ramp changes in measurement and set point
- Tune a P, PI or PID controller on simple flow, level and temperature loops
- Explain and tune basic cascade control loops
- Explain the basic concepts behind feedforward control
- Explain the basic concepts behind ratio and signal selector applications
- Identify and list symbols and terminology used in control loop drawings

6212 Process Measurement Technology
This instructor-led course will help increase plant availability and utilization while reducing plant corrective and preventive maintenance costs by generating a sound foundation in the engineering principles and theories behind the selection and use of common plant sensing devices: flow, pressure, temperature, level and electrochemical. This course will require you to
put to use what you learned in sizing flow devices and orifices. The course material is not tied to any specific vendor equipment. (Course code 6212, formerly 8212)

**Duration:** 5 Days

**Special Feature**
A reference book on Instrumentation is used as course text and will be provided as part of student course material

**Prerequisite**
- Ability to work with simple algebraic equations

**Who should attend?**
Experienced plant personnel with general instrumentation responsibilities which include, instrument selection, design, installation, purchasing or maintenance

**Objectives**
- Define uniform terminology in the field of process instrumentation
- Understand the basic theory, principles, and use of common plant process measurement instruments: Flow, Pressure, Level, Density, Temperature, and Electrochemical
- Identify the key mechanism required to build a field transmitter and realistic instrument operating conditions
- Identify qualitative and quantitative data that will help determine how to best select and effectively apply instruments for monitoring and controlling measurement variables: Pressure, Liquid Level, Density, Flow Temperature, pH, ORP, Conductivity, and Humidity
- Calculate flow rates and orifice sizing

**6235 Control Systems Engineering**
This instructor-led advanced engineering course will help increase plant utilization and performance by generating a sound foundation of process control theories explaining why processes behave the way they do, and therefore enabling you to apply more efficient methods of control. Most Process Control courses try to explain process control concepts in either a qualitative manner or a pure quantitative manner. Neither is satisfactory. The first simplifies the subject too much to make it useful for understanding how processes behave and why particular control strategies are successful. The later involves too much math to making the subject too abstract for any real-world application. The Control Systems Engineering course
combines a qualitative and quantitative approach. It explains the essential properties of process by the performances we observe on recorders and screens. In this way students begin to appreciate the essence of process control at once with a foundation easily built on. The labs and lectures build upon your practical work experience and require a mathematical background. Homework is required. (Course code 6235)

**Duration:** 5 days

**Prerequisites**
- At least 6 months of process control and instrumentation experience
- First year BSC degree or equivalent mathematical ability
- Invensys Learning course 6212, Process Measurement Technology or equivalent knowledge
- Invensys Learning course 6211, Process Control Technology, or equivalent knowledge

**Who should attend?**
Engineers with process control and instrumentation experience who wish to improve their grasp of the design and application of practical control systems

**Special Feature**
A reference book Process-Control Systems by F.G. Shinskey will be provided as part of student course material (while stocks last)

**Objectives**
- Describe dynamic elements in a control loop, both steady state and dynamic gains, loop gain and decay
- Describe the interactions traditional control modes of P, P&I, P&D, I, and PID have with predominately deadtime or lag processes
- Describe the characteristics of multi-capacity processes with interacting and non-interacting lags
- Describe the transmitter and valve characteristics and their impact on process control
- Describe the dynamics and characteristics of 5 common control loops,
  - Flow,
  - Pressure,
  - Liquid-level,
  - Quality and
  - Temperature
- Select and tune controllers for a wide variety of process loops
6242 Industrial Boiler Control Systems

This instructor-led comprehensive course will help increase plant availability by generating a sound understanding of the industrial boiler and its functions. This course is designed to cover the fundamental concepts related to industrial boilers control schemes. You will learn how control theories and practices relate to this highly specific area of industrial applications. This course includes coverage of Boiler basics and the steaming process, basic control loops and their system interconnection related to combustion of fuel, excess air, and products of combustion, the steam supply system, main steam and reheat steam of temperature control, feedwater control systems, boiler draft systems, measurement, MOCS and control of furnace draft., measurement and control of combustion air flow plus related functions, fuel gas analysis trimming of combustion control systems, combustion control for liquid and gaseous fuel boilers. (Course code 6242)

**Duration:** 5 Days

**Prerequisites**

- Six months of experience working with plant instrumentation and controls
- Invensys Learning course 6212, Process Measurement Technology or equivalent knowledge
- Invensys Learning course 6211, Process Control Technology or equivalent knowledge

**Who should attend?**

Operators, engineers, and supervisors who have some responsibility for industrial boiler operation should attend this course. This course provides a beneficial review of basic control principles for experienced personnel and novices

**Objectives**

- Recognize the basic process characteristics associated with industrial boiler systems and subsystems: deadtime, capacity, response time and interaction.
- Explain drum level control systems
- Explain combustion control systems
- Explain feedwater control systems
- Explain Superheat control systems
- MOCS control systems
- Implement Superheat control systems
6310 SPEC 200 Maintenance
This course covers the operation and calibration of the various types of SPEC 200 input cards (e.g., 2A1-13V), output cards (e.g., 2A0-V3I) and process cards (e.g., 2AP-ALM). Simple scaling for the summer and multiplier/divider cards is presented. It also includes an overview of power supplies and signal distribution. This practical course consists of lectures and lots of lab time. (Course code 6310 formerly 4310)

**Duration:** 5 days

**Prerequisites**
- Knowledge of basic electricity principles

**Who should attend?**
Engineers and technicians whose job responsibilities include installation, maintenance, and configuration of the SPEC 200 cards

**Objectives**
- Correctly use all SPEC 200™ documentation, including decoding nomenclature.
- Trace signals through the selected SPEC 200 cards and locate test points and calibration adjustments.
- Locate faulty electronic components using available Fault Location Flowcharts.
- Use point-to-point wiring lists and loop drawings to locate and replace faulty cards within a loop.
- Select SPEC 200 modules and cards required to instrument designated loop diagrams.
- Calibrate SPEC 200 cards and displays using accepted standards, procedures, and SPEC 200 test equipment.

6323 Intelligent Transmitters
This hands-on, instructor-led maintenance course will help you improve plant availability by using proper equipment installation and maintenance practices. You will learn the correct way to operate, calibrate, install, service, and configure selected Foxboro® Automation Intelligent transmitters. Lecture material will provide instruction on systematic calibration and maintenance procedures. During laboratory exercises, you will put in practice the procedures you have learned during the lecture. (Course code 6323)

**Duration:** 5 Days
Prerequisites
• Invensys learning course 6321 Measurement Principles for Technicians or equivalent experience

Who should attend?
Instrument mechanics/technicians and their supervisors who need to install or maintain Foxboro Automation Intelligent transmitters

Objectives
• Define common terms and expressions, which relate to process measurement devices
• Apply the principles of electronic transmission to Foxboro Automation Intelligent transmitters within safety constraints
• Use the PC50™ or equivalent to perform operation, and configuration procedures on Foxboro Automation Intelligent transmitters
• Describe the proper installation and maintenance procedures of Foxboro Automation Intelligent transmitters.
• Set-up a typical laboratory calibration test for Foxboro Automation Intelligent transmitters

6350 Fundamentals of Pneumatic Instrument Maintenance
This hands-on, instructor-led maintenance course will help you improve plant availability by using proper equipment installation and maintenance practices. You will master industry-standard operating procedures used with pneumatic instruments. You will explore the principles of operation behind pneumatic devices, and then reinforce your comprehension through extensive hands-on lab exercises. (Course code 6350)

Duration: 5 days

Who should attend?
Instrument technicians and others whose duties include pneumatic instrument maintenance, repair or the supervision of those functions

Prerequisites
• Invensys learning course 6321, Measurement principles for technicians or equivalent knowledge
• High school physics and mathematics
Objectives

- Repair pneumatic instruments by calibration or parts replacement
- Align motion and force-balance controllers
- Calibrate selected pneumatic instruments
- Verify proper repair or alignment of an instrument

6393 Model 743/760/761/762 User Maintenance
This application-oriented instructor-led course will help you increase plant availability by making familiar the operation of the Model 743/760/761/762 Single Station Micro Controllers and some examples of how to apply them. You will also have hands-on experience in the operation and configuration of the controllers. (Course code 6393, formerly 4393)

Duration: 5 days

Who should attend?
Personnel responsible for maintaining or configuring the Model 743, 760, 761 or 762 controller

Prerequisites

- Invensys Learning course 6211, Process Control Technology or equivalent knowledge

Objectives

- Operate, configure and calibrate the Model 743/760/761/762 Single Station Micro controllers
- Implement EXACT self-tuning to obtain satisfactory control of simulated processes
- Install the Model 743/760/761/762 Single Station controller
- Determine if a unit failure has occurred
Online Learning Series

**E5111 Configuring the PIDA Control Block**

This online lesson will help increase plant utilization and performance by generating a sound foundation of the features and use of the PIDA control block. The PIDA block implements continuous PID or dead-time feedback and additive and multiplicative feedforward control of an analog loop, providing advanced features compared with the PID and PIDX blocks. Its principal inputs, set point and measurement, are used to compute its output, the manipulated variable, based on user-set or adaptively tuned values of the tuning parameters, proportional band, integral time, derivative time, delay time, and set-point relative gain SPLLAG. In addition, the measurement filter time constant factor KD is adjusted by pretune and the deviation alarm delay DEVTIM is adapted. In a dead-time controller mode (PIDTAU or PITAU) the filter time FILTER can be adjusted if needed to prevent high frequency instability. The feedforward capability can be used to decouple interacting loops in addition to compensating for measured load upsets. In addition, extension connections can be made to the FBTUNE block that performs adaptive tuning. The features and use of the FBTUNE block is covered in another online training course. (Course code E5111)

**Duration:** 4+ hours

**Audience**

Process Control Engineers and System Administrators responsible for design, testing, maintenance of plant Foxboro control schemes.

**Prerequisites**

- High School Calculus
- Invensys Learning Course 6325 Control Systems Engineering (recommended)
- Invensys Learning Course 2001 or 5001 Configuration Essentials

**Objectives**

- Describe the parameters and parameter options required to establish and process a control block
- Describe the parameters and parameter options for linking and conditioning PIDA input and output signals
• Describe the parameters and parameter options for configuring PIDA control modes and tuning parameters
• Describe the parameters and parameter options for configuring PIDA Auto/Manual modes, initialization and back-calculations
• Describe the parameters and parameter options for configuring PIDA alarm condition types, actions, definitions, message groups and priorities
• Describe the parameters and parameter options for configuring PIDA level, deviation, controller output and quality alarms
• Describe the parameters and parameter options for PIDA alarm indicators and status
• Describe the parameters and parameter options for suspending, inhibiting and enabling PIDA alarms
• Describe the parameters and parameter options for setting output limits, securing write access and PIDA operation HMI screens for viewing the PIDA block
• Describe the parameters and parameter options for using the PIDA block PID functions such as:
  • Characterizing/Converting the Control Inputs
  • Setting Setpoint Clamping
  • Moderating the Impact of Setpoint Changes
• Describe the parameters and parameter options for using the PIDA block in more advanced control functions such as:
  o Non-linear Control in PIDA
  o Dead Time Compensation using PIDTau
  o Set Point Response with Dead Time Compensation on a Pure Delay Process
• Describe the parameters and parameter options for using the PIDA block in Cascade control applications
• Describe the parameters and parameter options for using the PIDA block in more advanced control functions such as:
  • Feed Forward Control
    o BIAS Input in PIDA
    o Applying BIAS Input for Feedforward Level Control
    o MULTIN Input in PIDA
    o Multin Input for Feedforward Composition Control
  • Supervisory Control
• Describe the parameters and parameter options for suspending control action triggered by errors in input signals and constrained automatic control
• Describe the parameters and parameter options for using the PIDA block in more advanced control functions such as:
Describe status information provided by the PIDA block

**Configuring the PIDA Control Block Lesson Plan**

PIDA 0 Introduction to the PIDA block (6:06 min)

**Module 1**

PIDA – 1A: A Block Identity and Configuration for Basic Control Applications (15:17 min)

- Establishing and Processing blocks
  - IA Control Hardware - Stations and Networks
  - IA Control Software – Compounds, Blocks, and Parameters
  - Basic Block Processing
  - PIDA Block Identity Parameters

PIDA – 1B: Block Identity and Configuration for Basic Control Applications (8:07 min)

- Linking PIDA Input and Output Signals
  - Basic Feedback Control Loop Structure
  - Defining Linkages for IA Blocks – Source and Sink
  - Change Deltas in IA Control Blocks

PIDA – 1C: Block Identity and Configuration for Basic Control Applications (14:43 min)

- Defining and conditioning input and output signals
  - Measurement
  - Setpoint
  - Output
- Determining PIDA Response Direction
  - Establishing Negative Feedback in Control Loops

PIDA – 1D: Block Identity and Configuration for Basic Control Applications (19:30 min)

- PIDA Control modes and Tuning Parameters
  - Control Modes in PIDA Blocks
  - Proportional-only Control in PIDA
  - Implementing Integral Action in PIDA – External Integral Feedback
Implementing Derivative Action
Combining Control Modes – the PIDA Algorithm(s)
PID Control – Interacting vs. Non-Interacting

PIDA – 1E: Block Identity and Configuration for Basic Control Applications (17:50 min)

- Manual and Automatic Operation
  - Automatic and Manual Operation
  - Initialization & Back-Calculation
  - Auto/Manual Transfer in P-only Control
- Summary
  - Complete Basic Control Loop Connections

Module 2

PIDA - 2A: PIDA Block Alarms and Operator Interface (17:04 min)

- Overview of PIDA block alarms
  - Alarms in Process Control
  - PIDA Alarm Condition Types
  - PIDA Alarm Condition Actions
  - PIDA Alarm Function Definition
  - Message Groups and Priorities

PIDA - 2B: PIDA Block Alarms and Operator Interface (14:41 min)

- Configuring PIDA alarms
  - Measurement Alarms – Level 1 Absolute Alarms
  - Measurement Alarms – Level 2 Absolute Alarms
  - Deviation Alarms
  - Controller Output Alarms
  - Data Quality Alarms
  - Re-alarming and Nuisance Alarms

PIDA - 2C: PIDA Block Alarms and Operator Interface (3:17 min)

- Alarm Output Indicators
  - Block Alarms – Status Indicators
PIDA - 2D: PIDA Block Alarms and Operator Interface (3:46 min)

- Suspending PIDA block alarms
  - Operational Control - Inhibiting and Enabling Alarms

PIDA - 2E: PIDA Block Alarms and Operator Interface (11:06 min)

- Operational Control of a PIDA block
  - Operational Control – Output Limits
  - Operational Control – Securing Write Access
  - Basic Operator Interface for PIDA Operational Control - Select Display
- Summary
  - PIDA Block Alarms and Operator Interface

**Module 3**

PIDA - 3A: Additional PIDA Functions and Advanced Applications (18:17 min)

- Characterizing PIDA block inputs
  - Characterizing/Converting the Control Inputs
- PIDA Block Setpoint Clamping
  - Setpoint Clamping
- Moderating the Impact of Setpoint Changes
  - Setpoint Changes and Proportional Action
  - Setpoint Ramping in PIDA

PIDA – 3B: Additional PIDA Functions and Advanced Applications (30:13 min)

- Non-Linear in PIDA
  - Non-linear Control in PIDA
- Controlling Processes with Significant Dead Time
  - Dead Time Compensation using PIDTau
  - Set Point Response with Dead Time Compensation on a Pure Delay Process
- PIDA in Cascade Control
  - Cascade Control Applications
  - Configuring PIDA for Cascade Control
PIDA – 3C: Additional PIDA Functions and Advanced Applications (20:03 min)

- PIDA in Feed Forward Control
  - BIAS Input in PIDA
  - Applying BIAS Input for Feedforward Level Control
  - MULTIN Input in PIDA
  - Multin Input for Feedforward Composition Control
- PIDA in Supervisory Control
  - Supervisory Control and PIDA

Module 4

PIDA - 4A: Intermittent Operation & Operating Status Information (18:08 min)

- Overriding Auto / Manual Status
  - Auto/Manual Operation – Revisited
- Suspending Control Action
  - Suspending Control Action
- Holding Errors in Input Signals
  - PIDA – Error Bit Propagation
  - PIDA Response to Bad Inputs
- Constrained Operation in PIDA
  - Constrained Automatic Control

PIDA – 4B: Intermittent Operation & Operating Status Information (18:20 min)

- Batch Operations in PIDA
  - Batch Operations
- Intermittent Measurements in PIDA
  - Controlling Dis-continuous Measurements

PIDA – 4C: Intermittent Operation & Operating Status Information (19:22 min)

- Status Information in PIDA
  - Examining the Current Status – Control
  - Examining the Current Status – Active Alarms
  - Examining the Current Status – Inhibited Alarms
  - Combined Control and Alarm Information
E5112 Configuring the FBTUNE Feedback Tuner Block
This online lesson will help increase plant utilization and performance by generating a sound foundation of the features and use of the FBTUNE block. The FBTUNE block is used to adaptively tune gain schedules for the proportional band PBAND, the integral time INT, derivative time DERIV, dead time DTIME, and the relative gain on setpoint (SPLLAG) of the PIDA and DPIDA blocks. FBTUNE also sets the deviation alarm delay DEVTIM and the filter time constant FILTER used to prevent high frequency instability in the PITAU and PIDTAU deadtime controller modes. (Course code E5112)

Duration: 60 minutes

Audience
Process Control Engineers and System Administrators responsible for design, testing, maintenance of plant Foxboro control schemes.

Prerequisites
- High School Calculus
- Invensys Learning Course 6325 Control Systems Engineering (recommended)
- Invensys Learning Course 2001 or 5001 Configuration Essentials
- Invensys Learning Online lesson E5111, using and configuring the PIDA control block

Objectives
- Describe the underlying concepts of controller tuning
- Describe what does a FBTUNE block do
- Describe the differences between Auto-tuning and Self-tuning
- Describe how to configure the connection between a FBTUNE and PIDA block
- Describe the parameters and parameter options for configuring the FBTUNE block
- Explain how boundaries on the FBTUNE block are set
- Describe the usage of the Pre-tune function in the FBTUNE block
- Operate the FBTUNE block using the block’s detail display
- Explain how and when the FBTUNE block should and should not be used
- Describe how to get the best out of the FBTUNE block through proper setting of key FBTUNE block parameters
- Configuring the PIDA Control Block Lesson Plan
Configuring the FBTUNE Feedback Tuner Block Lesson Plan

FBTUNE – 1: Auto-Tuning - What are the underlying concepts? (13:25 min)

- What is controller tuning?
- Proper Tuning is based on a Process Model
- Loop Gain and Stability
- What does an FBTUNE block do?

FBTUNE – 2: Connect to PIDA Target and Configuring for Successful Tuning (16:16 min)

- Auto-Tuning vs. Self-Tuning
- Configuring the connection
- Configuring FBTUNE Blocks for successful tuning
  - Configuring FBTUNE – Creating the block
  - Two Key Parameters
  - Setting Boundaries on the FBTUNE

FBTUNE – 3: Operation of the FBTUNE block (6:39 in)

- Pre-tune function in FBTUNE
- Operation of the FBTUNE Block

FBTUNE – 4: Managing FBTUNE – Standard Detail Display and Functions (9:08 min)

- PIDA Block detail Display
- FBTUNE Block Detail Display
- Tuning Display in PIDA block

FBTUNE – 5: Application Tips and Conclusion (14:44 min)

- THRESH Setting
- ITMAX Setting
- Maximum PB