

NELSON MANDELA
UNIVERSITY

SIEMENS PLC COURSES

SIEMENS Accredited TRAINING CENTRE

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Introduction to Programmable Logic Controllers (ST-PLCINTRO)

Duration: 5 Days

Pre-requisite:

No pre-requisite required for the course. General technical competence would assist accelerated learning.

Aims and Objectives:

The training aim of this course is to teach basic instructions of a PLC with a strong element of practical, hands-on simulation of industrial related circuits. The course is paced to suit all learners. This course is not for people with prior PLC knowledge and programming.

Course content:

Introduction

Basic PLC instructions:

Wiring instructions

Input / Output

Open and closed contacts

Series connections - AND functions

OR functions

Timers

Counters

Internal relays and functions

Basic ladder diagram design

Sequential interlock programming

S7 Maintenance Course Part 1 (ST-7SERV1)

SIMATIC S7 Service and Maintenance 1 (old S10 & S15)

Duration: 5 Days

Pre-Requisite:

Involvement in PLC Maintenance

Aims and Objectives:

This course is directed at users and maintenance personnel of SIMATIC S7 Programmable controllers

The SIMATIC S7 System Family

PLC installation & wiring techniques & Hardware Handling

From process to project – the Simatic Manager

Hardware configuration, addressing of Signal Modules & CPU properties

Symbolic notation & symbols table handling

LAD/FBD/STL editor

Commissioning & Monitoring/Modifying Variables

Linear/Structured Programming techniques

Debugging a program

Binary operations, Digital operations

Rewiring of programs

Documentation functions, Saving, Archiving,

Copying programs to memory cards

S7 Maintenance Course Part 2 (ST-7SERV2)

SIMATIC S7 Service and Maintenance 2 (old S20 & Analogues)

Duration: 5 Days

Pre-Requisite:

Successful completion of the SERV1 Course

Aims and Objectives:

This course provides the fault finding techniques required for maintenance and in-depth exercises with standard libraries. For those wanting to handle OB's and Data handling. Documentation, networking & analogues as well as sequence control.

Course Content: (Excerpt)

Hardware commissioning

Memory reset. Variable tables.

Modifying outputs in STOP state

Data storage in Data Blocks

Complex Data types

Functions & Functioning Blocks

Multiple instance Model

Trouble shooting

B, I, L stack handling, Cross reference

Breaking points in a program

Organisation blocks

Analog processing

Documentation & printing & Archiving a project

Communication via MPI with GD table and NETPRO

Totally Integrated Automation

TIA Portal Service & Maintenance Part 1 (TIA-SERV1)

Duration: 5 days

Pre-requisite:

Basic knowledge of Siemens PLC automation technology.

Aims and Objectives:

The Totally Integrated Automation Portal (TIA Portal) forms the work environment for integrated engineering with SIMATIC STEP 7 and SIMATIC WinCC.

In this first part of the SIMATIC TIA Portal service training, we teach you the handling of the TIA Portal, basic knowledge about the structure of the SIMATIC S7 automation system, configuration and parameterization of hardware, and the basics of programming. You also receive an overview of HMI, PROFINET IO, and connecting drives. You will learn to diagnose and clear simple hardware faults and software errors. You will thus be capable of reducing downtimes in your plant.

You can deepen your theoretical knowledge with numerous practical exercises on a TIA system model. This consists of a SIMATIC S7 automation system, ET200 distributed I/O, Touch panel, drive, and a belt model.

Content:

Overview and significant performance characteristics of the SIMATIC S7 system family

The components of the TIA Portal: STEP 7, WinCC, communication

Program execution in automation systems

Binary and digital operations in the function block diagram (FBD)

Setup and assembly of the automation system

Addressing and wiring the signal modules

Hardware and software commissioning of the SIMATIC S7 automation system with the TIA Portal

SIMATIC S7 hardware configuration and parameterization

Presentation of a Touch panel

Presentation of the drive

Setup and parameterization of PROFINET IO

Saving and documentation of the implemented program changes with the TIA Portal

Deeper understanding of contents through practical exercises on TIA system model

TIA Portal Service & Maintenance Part 2 (TIA-SERV2)

Duration: 5 Days

Pre-requisite:

Completion of the TIA-SERV1 course

Aims and Objectives:

The Totally Integrated Automation Portal (TIA Portal) forms the work environment for integrated engineering with SIMATIC STEP 7 and SIMATIC WinCC.

The second part of the SIMATIC TIA Portal service training is based on the knowledge of the TIA Portal gained in the SIMATIC TIA Portal service 1 course, including SIMATIC STEP 7, HMI, connection of drives, and PROFINET IO. You will expand your troubleshooting and error correction knowledge -using the TIA Portal diagnostic tool in the commissioning and productive phase. Alarms are displayed on an operator control and monitoring system. You will learn about the included test functions for controlling programs in Structured Control Language (SCL). You will implement a sequence control in SIMATIC S7-GRAPH and integrate the analogue value processing.

You will thus be able to adapt your plant to new demands and to reduce downtime.

You can deepen your theoretical knowledge with numerous practical exercises on a TIA system model. This consists of a SIMATIC S7 automation system, ET 200 distributed I/O, Touch panel, drive, and a belt model.

Content:

Hardware diagnostic functions of the TIA Portal in the SIMATIC S7 automation system

Software diagnostic functions of the TIA Portal in the SIMATIC S7 automation system

Possible applications of various block types (function (FC), function block (FB), organization block (OB), data block (DB))

Principles of analogue value processing

Sequence control with S7-Graph

Commissioning of distributed I/O on PROFINET IO

Alarm configuration in WinCC

Parameterization of the drive

Test functions in Structured Control Language (SCL)

Deeper understanding of contents through practical exercises on TIA system model

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S7 Programming Course Part 1 (ST-7PRO1)

SIMATIC S7 Programming

Duration: 5 Days

Pre-Requisite:

Programmers and System integrators involved with SIMATIC 7 programmable controllers.

Aims & Objectives:

This course is directed at users with engineering experience in the fields of configuring, design & commissioning of SIMATIC S7 programmable controllers. This course provides an optimal entry level to the product-specific and in-depth supplementary courses.

Course Content: (Excerpt)

The SIMATIC S7 family & the Simatic Manager
Configuration & addressing of modules, CPU properties, symbols tables
Basic functions & jumps
Number formats, Timers & Counters
Data handling including arrays & structures
Functions & Function Blocks with assignable parameters
Multiple instance Model
Diagnostics with B, I, L stacks, Monitor/modify variables & debugging
OB's & start-up considerations
Analog Value processing
Documenting, Savings, Archiving
Communication via MPI GD table & subnets
Totally Integrated Automation principles
S7-GRAPH, S7-HIGRAPH & S7-SCL high-level languages discussion

S7 Programming Part 2 (ST-7PRO2)

SIMATIC S7 Service Advanced Programming

Duration: 5 Days

Pre-Requisite:

Successful completion of the ST7PRO1 Course

Aims & Objectives:

Advanced programming techniques. This course is directed at users with engineering experience in the fields of configuring, design and commissioning of SIMATIC S7 programmable controllers. The knowledge and skills acquired in the ST-7PRO1 course will be consolidated and extended to enable the participant to structure and generate and put into operation complex programmes. The knowledge provided by this course makes it easier to solve complex programming problems.

Course Content: (Excerpt)

Status Bit-Dependent Instructions

Accumulator Functions & Word logic

Instruction with REAL numbers

Indirect addressing & Address Register Instructions

Pointer structure with Memory indirect addressing

STEP7 Data types & Variables, ARRAY's & STRUCTURES

Using Libraries & System Functions

Handling Synchronous & Asynchronous Errors

Basic & expanded S7 Communication

S7-GRAPH, S7-HIGRAPH software packages

Engineering tools for S7/M7

Connection to PTP, PROFIBUS, Industrial Ethernet, Internet

SIMATIC S7-400 & 400H

State Graphs, SCL structures

CFC & SFC editor

TIA Portal Programming - Part 1 (TIA-PRO1)

SIMATIC S7 Programming

Duration: 5 Days

Target Group:

Programmers

Commissioning engineers, configuring engineers

Pre-Requisites: Basic knowledge of automation technology

Aims & Objectives:

The Totally Integrated Automation Portal (TIA Portal) forms the work environment for integrated engineering with SIMATIC STEP 7 and SIMATIC WinCC. In this first part of the SIMATIC TIA Portal programming training, we teach you the handling of the TIA Portal, basic knowledge about the structure of the SIMATIC S7 automation system, configuration and parameterization of hardware, and the basics of standard PLC programming. You also receive an overview of HMI, PROFINET IO, and connecting drives.

You can deepen your theoretical knowledge with numerous practical exercises on a TIA system model. This consists of a SIMATIC S7 automation system, ET200 distributed I/O, Touchpanel, drive, and a belt model.

After attending the course, you can do the following:

- Understand the fundamentals of interaction of the TIA components
- Solve simple programming tasks using elementary STEP 7 instructions
- Reliably operate the "TIA Portal" engineering platform
- Program simple plant functions with basic STEP 7 instructions in the ladder diagram (LAD) or function block diagram (FBD)
- Perform simple commissioning of TIA components

This blended learning course combines web-based training on the Internet with a 5-day attendance course: To prepare for the attendance course, you will receive the web-based training course (WBT) "PLC Knowledge for Beginners" and "SIMATIC TIA Portal Structured Programming". This allows you to improve your personal learning achievement in the attendance course.

Course Content: (Excerpt)

Overview and significant performance characteristics of the SIMATIC S7 system family
The components of the TIA Portal: STEP 7, WinCC, communication
Program execution in automation systems
STEP 7 block types and program structuring
Binary and digital operations in the function block diagram (FBD)
Programming of parameterizable blocks
Data management with data blocks
Programming organizational blocks
Test tools for system information, troubleshooting, and diagnostics
Hardware configuration and parameterization of the SIMATIC S7-300 modules, a PROFINET IO system (ET-200S), a Touch Panel, and a drive (Micromaster 420)
Program documentation and saving
Deeper understanding of contents through practical exercises on TIA system model

TIA- Portal Programming – Part 2 (TIA-PRO2)

SIMATIC S7 Programming

Duration: 5 Days

Pre-requisite: Successful completion of PRO1

Aims and Objectives:

The Totally Integrated Automation Portal (TIA Portal) forms the work environment for integrated engineering with SIMATIC STEP 7 and SIMATIC WinCC. The second part of the SIMATIC TIA Portal programming training is based on the knowledge of the TIA Portal gained in the SIMATIC S7 TIA Portal programming 1 course, including STEP 7, SIMATIC S7, HMI, connection of drives, and PROFINET IO. You will expand your knowledge of complex operations in statement lists (STL) and in Structured Control Language (SCL). Along with analog value processing and data administration with complex data types, the evaluation and handling of program-related errors are also considered. Building on this, you will learn how to display messages on the operator control and monitoring system (HMI). Thanks to the knowledge imparted, you will gain new impetus and ideas for efficient PLC programming. You can deepen your theoretical knowledge with numerous practical exercises on a TIA system model. This consists of a SIMATIC S7 automation system, ET200 distributed I/O, Touchpanel, drive, and a belt model.

After attending the course, you will be able to do the following:

- Understand the interaction of TIA components
- Apply classical program development methods
- Solve comprehensive programming tasks
- Program advanced functions such as indirect addressing in STEP 7 statement lists (STL) and in Structured Control Language (SCL)
- Implement data administration with the SIMATIC S7 automation system
- Apply system blocks along with blocks from the standard STEP 7 library
- Program classical software error handling and evaluation
- Configure alarms of the operator control and monitoring system (HMI)
- Configure TIA system components consisting of SIMATIC S7, HMI, PROFINET IO, and drive

This blended learning course combines web-based training on the Internet with a 5-day attendance course: To prepare for the classroom course, you will receive the web-based training course (WBT) "PROFINET". This allows you to improve your personal learning achievement in the attendance course.

Requirements:

SIMATIC S7 knowledge corresponding to TIA-PRO1

You can use the available online entry test to ensure that the selected course matches your area of expertise.

Target group

Programmers

Commissioning engineers, configuring engineers

Course Content: (Excerpt)

- Tools for program creation (e.g. structograms)
- Analog value processing
- Functions, function blocks, and multi-instances using the IEC-compliant timer/counter as an example (International Electrotechnical Commission)
- Jump commands and battery operations
- Indirect addressing
- Classical software error handling and evaluation with error organization blocks (OBs)
- Evaluation of diagnostic data
- Troubleshooting and alarms with an HMI device (Touchpanel)
- Introduction into Structured Control Language (SCL) and S7-GRAPH
- Deeper understanding of contents through practical exercises on TIA system model

Analogue Value Processing & Closed Loop Control (ST-7PID)

Duration: 5 Days

Pre-requisite:

Successful completion of the ST-7PRO1 or ST-7SERV2 courses.

Aims and Objectives:

This course will enable Service and Commissioning personnel to work with analogue signals and effectively optimize control loops.

Course Content:

Fundamentals of analogue value processing

Fundamental concepts of closed-loop control

Optimizing criteria

Controller selection

PID algorithm for digital control

Continuous, Quasi-continuous and Discontinuous control

Multi-loop control

Course exercises

Questions and answers

TIA Structured Control Language Course (TIA-SCL)

Duration: 5 Days

Pre-requisite:

Successful completion of the TIA-SYSUP, TIA-SERV1 or TIA-PRO1 course.

Aims and Objectives:

The Totally Integrated Automation Portal (TIA Portal) provides the working environment for end-to-end engineering with SIMATIC STEP 7 and SIMATIC WinCC.

Select this course if you want to program SIMATIC S7 using a high-level programming language.

Using simple examples, we will show you the advantages offered by a high-level programming language.

The course aims to inform participants about the complete language and performance scope of the Structured Control Language (SCL) development environment.

During the training course, you will create, commission, and test your own SCL programs. In this way, you can implement your theoretical knowledge in a direct, hands-on way on a TIA system model, consisting of a SIMATIC S7 automation system, thereby increasing your learning success.

After the course, you will be able to reduce the amount of time spent on creating and maintaining programs through the use of a high-level programming language (SCL) instead of Statement List (AWL).

Create, commission, and test programs in SCL

Course Content:

SCL editor

Program draft

Data types, operations

Formulating functions and function blocks in SCL

Working with tags and symbolic block names

Introduction to the SCL command set

Creating, commissioning, and testing your own SCL programs

Participant Pre-requirements

Introduction to Profibus, Ethernet, Profinet (SCT-S7NETSIA) Introduction to SIMATIC NET

Duration: 3 Days

Prerequisite:

S7-PRO 1 or S7-SERV 2

Aims and Objectives:

Upon completion of this course, the student shall be able to:

Describe the various Industrial networking options and terminology in the S7 environment.

Install and configure simple networks including: AS-i, MPI, Profibus and Ethernet

Perform Master-to-Master communications between 2 or more S7 PLC's

Configure and troubleshoot SEND/ RECEIVE connections

Perform basic troubleshooting and maintenance on the covered networks

Course content:

This course provides an introduction to Multi-Point Interface (MPI), PROFIBUS, Ethernet and Actuator-Sensor Interface (AS-i) networks within an S7 PLC automation system. Students will build skills with the basics of network installations, configuration and troubleshooting. This course covers hardware and software requirements as well as important specifications and installation rules for the different networks that are discussed. Specific network protocols are discussed and lab exercises are used to learn configuration and parameterization requirements with SIMATIC Net. The course combines theoretical concepts with hands-on exercises to give the learner a well-rounded learning experience.

Industrial Communications

PROFINET with Industrial Ethernet in TIA Portal (IK-TIAPN)

Duration: 4 Days

Prerequisite: Minimum TIA SERV1 (TIA SERV 2 recommended)

Aims and Objectives:

- Learn about the principals of industrial ethernet
- Learn about networking hardware (including managed switches)
- Learn about the Profinet protocol
- Learn about different network topographies and how to make redundant networks
- Learn how to wire a Profinet plug
- Learn about Realtime communication protocols
- Learn about master-slave coms, master-master coms and I-Devices
- Expand your knowledge on the networking side of TIA and some new software tools from Siemens

Course content:

- Industrial Ethernet & the basics of the protocol
- Profinet and how it relates to industrial ethernet and Profibus
- Components needed to build an industrial ethernet or Profinet network, including network topographies
- Basics of Profinet including; RT, IRT and how to use Proneta
- Commissioning a Profinet system using TIA Portal, both the manual method and the automatic method
- Use the Topography view in TIA Portal
- Perform diagnostics on a Profinet system
- Setup and use the s7-1500's build in webserver, allowing access and diagnostics to be done anywhere in the world. Also create custom end user webpages.
- Using ring topographies with Profinet to prevent breakdown
- Create shared distributed devices, i.e. shared between multiple PLCs
- Profinet IRT the next generation or realtime communication
- Intelligent IO devices
- Gateways and how they work
- S7 communication and open communication protocols

Distributed Safety – (ST-PPDS)

Configuring and Programming with Distributed Safety

Duration: 2 Days

Pre-requisites:

Basic knowledge of SIMATIC S7 according to the courses ST-SERV2 or ST-PRO1

Aims and Objectives:

With Safety Integrated, we provide the intelligent solution to the ever-increasing demand for functional safety in machines and plants. Safety Integrated provides comprehensive and integrated solutions for the manufacturing and process industry, and it reliably protects people, machines and the environment, while fulfilling current and future efficiency and flexibility requirements.

In this course, you will learn about configuring, programming, starting up, diagnosing and troubleshooting of the failsafe CPUs of the SIMATIC 300. These include the failsafe CPUs of the SIMATIC 300 and the failsafe ET200 systems. The course provides an introduction to the creation of safety-related programs in the programming languages F-FBD and F-LAD.

Course content:

Overview of European safety regulations and standards

S7-300F (principle, system configuration and I/O)

Configuring of the failsafe I/O with Distributed Safety

Programming of a safety-related user program

Failsafe communication over PROFIsafe (CPU-CPU communication)

Diagnostics facilities (CPU diagnostics, I/O diagnostics, advanced diagnostics)

Exercises for I/O configuration, communication, troubleshooting

Programming examples (emergency stop, protective door, safety-related shutdown, passivation, special programming features)

Deeper understanding of contents through practical exercises on the SIMATIC S7-300 system

Additional Comments:

In this course you will work with the SIMATIC STEP 7 V5.5 software. You will put your theoretical knowledge to use in practical exercises

WinCC Flexible (ST-WINCCFLEX)

Duration: 3 Days

Pre-requisites:

Successful completion of the ST-7SERV1 & ST-7SERV2 courses.

Aims and Objectives:

This course will enable Service and Commissioning personnel to commission the HMI unit.

Course Content:

System Overview

The Project

Basics of Graphic Design

Extended Graphics Design

The Message System

User Management

Process Value Archiving

Recipe Management

Runtime-Scripting

Sm@rtAccess

Sm@rtService

Migration from ProTool / Pro to WinCC flexible V1.0

TIA Portal WinCC HMI Course (TIA-WCCM)

Duration: 3 days

Pre-requisites:

Successful completion of the TIA-SYSUP or the TIA-SERV1

Aims and Objectives:

The Totally Integrated Automation Portal (TIA Portal) constitutes the work environment for integrated engineering with SIMATIC STEP 7 and SIMATIC WinCC. The course provides you with the knowledge to quickly and easily configure machine and plant-specific HMI tasks using the SIMATIC WinCC software based on the TIA Portal. You will learn to design graphic images. You will learn how to archive messages and values and to design and implement the corresponding archives. You can effectively use the engineering phase thanks to what you have learned about reliably operating the system.

The course contents are supported by numerous practical exercises on a plant model. This consists of a SIMATIC S7 automation system and various HMI stations

Course Content:

System overview TIA Portal, SIMATIC WinCC (machine-level)

Creating a SIMATIC WinCC project

Configuration of connection to the SIMATIC S7 automation system

Basics of graphic image creation for operator control and monitoring

User administration

Alarm display, alarm logging, alarm configuration

Tag logging, trend configuration, trend display

Recipes

Use of various HMI stations

Deeper understanding of contents through practical exercises on TIA system model

Fundamentals of AC Drives (ST-DRV-FUN)

Service and Commissioning the G120 drive

Duration: 5 Days

Pre-Requisites: Electrical Engineering background

Aims and Objectives: To prepare the electrician / technician / engineer for a sound understanding of drive technology. This course provides extensive information for activities in the field of electrical drive technology. The topics are addressed in a general manner, independent of specific products. Practical exercises using a G120 training unit are an important component. On completion of the course, you will have mastered safe handling of the STARTER commissioning tool as well as basic commissioning in TIA portal.

Course Content:

Motor theory

Inverter theory

Programming of the unit

Basic installation / configuring steps

Course exercises

Control and set up points from various sources

Communication with PROFINET

Basic commissioning of G120 using operator panel, Starter and TIA portal

TIA Portal Distributed Safety (TIA-PPDS)

Duration: 3 Days

Pre-Requisites:

To attend this course, participants **MUST** have attended the Siemens Sitrain TIA-SERV1 and TIA-SERV2 or TIA-PRO1 and TIA-PRO2 courses.

Short Description:

The Totally Integrated Automation Portal (TIA Portal) forms the work environment for integrated engineering with SIMATIC STEP 7 and SIMATIC WinCC. In this course, you will learn about configuring, programming, starting up, diagnosing and troubleshooting of the failsafe CPUs of the SIMATIC S7 Safety PLC (no H systems) and the failsafe distributed ET200 systems.

You will apply your theoretical knowledge thorough numerous practical examples carried out on our state-of-the art SIMATIC S7-1500F training system.

Aims and Objectives:

After attending the course, participants should be able to do the following:-

Starting up failsafe CPUs of the SIMATIC PLC

Programming of safety-related programs in the languages F-FBD and F-LAD

Diagnosing and troubleshooting of safety-related programs.

Continued.....

Course Content:

Overview and guidelines

AS S7 Safety (principle, system configuration and I/O)

Configuring of the failsafe I/O with STEP 7 Safety Advanced

Programming of a safety-related user program

Failsafe communication PROFIsafe (CPU-CPU communication, master-slave communication)

Diagnostics facilities (CPU diagnostics, I/O diagnostics, advanced diagnostics)

Exercises for I/O configuration, communication, troubleshooting

Programming examples (emergency stop, protective door, safety-related shutdown, passivation, special programming features, feedback monitoring, etc.)

Deeper understanding of contents through practical exercises on the SIMATIC S7-1500F system

In this course you will work with the SIMATIC STEP 7 software based on TIA Portal and SIMATIC S7-1500F hardware.

Target Group

- Programmers
- Commissioning engineers
- Engineering personnel

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