

PLC, SCADA, and HMI Systems for Beginners

Learn to program Siemens S7-1200/S7-1500 PLCs, configure WinCC Advanced SCADA systems, and design HMI interfaces for industrial automation.

21

MODULES

70

TOPICS

10

HANDS-ON ACTIVITIES

COURSE OVERVIEW

This integrated course provides a complete journey through industrial automation using Siemens technologies. Covering the programming of Siemens S7-1200 and S7-1500 PLCs with TIA Portal, the configuration and administration of SCADA systems using WinCC Advanced, and best practices in Human-Machine Interface (HMI) design and implementation, the program combines theory with extensive hands-on practice. Participants will gain skills to confidently design, implement, and troubleshoot real-world automation systems across factory, process, and machine automation environments.

WHO THIS COURSE IS FOR

This course is designed for:

Engineering students seeking applied knowledge in PLCs, SCADA, and HMI systems

Automation engineers, system integrators, and maintenance technicians

Electricians and technical staff transitioning into Siemens-based systems

IT professionals supporting industrial automation projects

Anyone aiming to master practical Siemens industrial automation technologies

PREREQUISITES

Prerequisite Knowledge/Skills:

- Basic understanding of electrical circuits and industrial automation principles.
- Familiarity with programming concepts (not mandatory but beneficial).
- General awareness of industrial networks and controllers.

What You Will Learn

After completing this course, participants will be able to:

- Explain industrial automation concepts and different types of control systems
- Program Siemens S7-1200 and S7-1500 PLCs using TIA Portal in multiple programming languages
- Configure and administer SCADA systems using WinCC Advanced, including alarms, trends, and data logging
- Design user-friendly HMI interfaces aligned with industry standards and best practices
- Perform analog signal processing, fault diagnostics, and parameter management
- Develop, deploy, and troubleshoot integrated industrial automation solutions

COURSE SYLLABUS

21 Modules, 70 Topics

PART 1 Siemens PLC Programming with TIA Portal

01

Introduction to Automation and PLCs

TOPICS

- What is automation
- Types of control systems
- Closed-loop control systems
- PLC overview, units, advantages and disadvantages
- Industrial applications of PLCs

02

PLC Architecture and Components

TOPICS

- PLC block diagram and CPU details
- Input/output modules and power supply
- Expansion modules and overall system architecture
- PLC capabilities and selection criteria

03

S7 Controllers and Programming Fundamentals

TOPICS

Overview of S7 controllers · Addressing digital I/Os · Communication protocols (Profibus, etc.) · Sink and source concepts · CPU scan cycle and PLC programming languages

04

TIA Portal Fundamentals and Project Setup

TOPICS

- Introduction to TIA Portal environment
- Hardware configuration and project creation
- PC and PLC communication setup
- Clock memory, memory reset, and language switching
- Cyclic program execution and selection of PLC models

05**Practical lab**

Basic PLC Programming Techniques

TOPICS

- Writing instructions and logical operations (AND, OR, NOR)
- Data types and result of logic operation (RLO) concepts
- Load, work, and system memory

06**Practical lab**

Timers, Counters, and Advanced Program Design

TOPICS

Timer types and usage (pulse, delay, etc.) · Counter operations and comparison functions · Program design techniques

07

Program Structure, Blocks, and Interrupts

TOPICS

FB vs FC block architecture and editing · Program organization and calling routines · Warm, cold, and hot restart behavior · Time-of-day and cyclic interrupts

08**Practical lab**

Processing of Analog Values

TOPICS

Analog sensor wiring and signal flow · Engineering value conversion · Use of Norm X and Scale X function blocks

09**Practical**

Diagnostics, Faults, and Parameter Passing

TOPICS

- Functional vs system faults
- Cross-reference tools and forcing I/O variables
- Parameter passing and shared data blocks

10

Practical Examples and Course Review

TOPICS

Real-world integrated programming examples · Consolidated course review and discussion

PART 2

Siemens SCADA Systems with WinCC Advanced

11

Introduction to SCADA Systems

TOPICS

- Overview and functions of SCADA
- Siemens SCADA architecture examples
- Data acquisition, communication, and visualization
- Comparison of PLC vs PC and real-world applications

12**Activity**

Creating SCADA Projects in WinCC Advanced

TOPICS

- Project creation and adding devices
- Setting up Ethernet addresses and runtime configuration
- Connecting to integrated and non-integrated PLCs

13

Configuring Graphics and Displays

TOPICS

- Graphic view setup
- Text and alphanumeric displays
- Configuring text lists, graphic lists, movement and fill properties

14

Practical exercise

Alarm Management

TOPICS

- Alarm configuration steps and message blocks
- Alarm classes and discrete trigger settings
- Displaying and managing alarms in WinCC Advanced

15

Practical exercise

Data Logging and Trend Analysis

TOPICS

Process value logging and data log setup · Editing tags and trend view configuration · Properties of trend views

16

Activity

Recipe Management

TOPICS

- Structure and editing of recipes
- Communication with controllers through tags
- Table representation, sorting, exporting, and configuring views

17

Practical exercise

User Administration and Access Control

TOPICS

- User administration structure and access protection
- Creating authorizations and assigning them to objects
- Configuring user groups and login dialogues

18

HMI Fundamentals and WinCC Overview

TOPICS

- HMI definition and its role in automation
- Components of WinCC and engineering/runtime editions
- Licensing, system limits, and requirements

19

Project Creation and Device Integration

Practical exercise

TOPICS

- Adding devices and establishing PLC connections
- Configuring runtime settings and basic HMI elements

20

HMI Configuration and Best Practices

TOPICS

- Designing user-friendly screens
- Input/output field configuration and graphical lists
- Configuring movement, fill properties, and navigation

21

Advanced HMI Functions

TOPICS

- Alarm, data logging, trend and recipe integration into HMI
- User administration and security in HMI applications
- Best practices for usability, visualization, and ethical design

Practise What You Learn

#	MODULE	ACTIVITY
05	Basic PLC Programming Techniques	Practical labs: Lamp and motor control using NO/NC contacts and branching networks
06	Timers, Counters, and Advanced Program Design	Practical labs: Sequential motor control, conveyor systems, car parking logic
08	Processing of Analog Values	Practical lab: Analog speed regulation using potentiometer signals
09	Diagnostics, Faults, and Parameter Passing	Practical: Troubleshooting scenarios
12	Creating SCADA Projects in WinCC Advanced	Basic configuration exercises: Basic configuration exercises with buttons and outputs
14	Alarm Management	Practical exercises: Practical exercises
15	Data Logging and Trend Analysis	Practical exercises: Practical exercises in data analysis
16	Recipe Management	Recipe editor setup and practical exercises: Recipe editor setup and practical exercises
17	User Administration and Access Control	Practical exercises: Practical exercises in user management
19	Project Creation and Device Integration	Practical exercises: Practical exercises with push buttons and outputs

WHAT IS INCLUDED

Everything You Need to Succeed

- Koenig course material for every module
- Delivery by certified instructors and subject matter experts
- Hands-on exercises throughout the course
- Course completion certificate from Koenig

ABOUT KOENIG

Who We Are

Established in 1993, Koenig Solutions is a globally recognised training provider with 35+ technology partnerships, 5,000+ training programmes and a network of certified instructors and subject matter experts, supporting individuals and enterprise teams worldwide.

FLEXIBLE DELIVERY

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Classroom Training

Live Online Classes (ILO)

Fly-Me-A-Trainer (FMAT)

Flexi (Self-Paced)

1-on-1 Training

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