KOENIG SOLUTIONS · COURSE OUTLINE

Mastering Siemens S7-1200/S7-1500 PLCs Programming with TIA Portal

Learn to configure, program and troubleshoot Siemens S7-1200/S7-1500 PLCs in TIA Portal, from architecture to analog processing and fault diagnostics.

10	69	9
MODULES	TOPICS	HANDS-ON ACTIVITIES

COURSE OVERVIEW

This course is designed to provide participants with a comprehensive understanding of Programmable Logic Controllers (PLCs) and their use in industrial automation, specifically focusing on Siemens S7-1200 and S7-1500 systems. It covers the fundamentals of automation, types of control systems, PLC architecture, programming languages, and I/O modules within the Siemens TIA Portal environment. Participants will gain practical insights into analog processing, fault diagnostics, and parameter passing. Whether using simulation tools or real hardware, learners will develop skills to confidently program and troubleshoot Siemens PLC systems using TIA Portal.

WHO THIS COURSE IS FOR

This course is suitable for a wide range of learners interested in industrial automation, including:

- **Engineering students aiming to develop skills in PLC programming and automation**
- **Technicians, electricians, and maintenance personnel seeking to upgrade their capabilities**
- **Engineers and managers involved in automation projects**
- **Anyone interested in acquiring a practical understanding of industrial automation systems**

PREREQUISITES

- There are no specific prerequisites for this course. However, a basic understanding of electrical and electronic circuits is beneficial.

LEARNING OBJECTIVES

What You Will Learn

Upon completion of this course, participants will be able to:

- Understand the basics of automation and different types of control systems
- Describe the different types of PLCs and their applications
- Explain the architecture of a PLC and various I/O modules
- Program a PLC using ladder logic, function block diagrams, and structured text
- Understand analog signal processing and perform fault diagnostics
- Apply parameter passing techniques and utilize shared data blocks effectively

COURSE SYLLABUS

10 Modules, 69 Topics

01

Introduction to Automation and PLC

TOPICS

What is automation? · Different types of control systems · Closed loop control system · Introduction to PLC controller · PLC units · Advantages and disadvantages of PLCs · Applications of PLCs

02

PLC Architecture

TOPICS

PLC block diagram · Input and output modules · Power supply modules · Main PLC CPU details · General PLC architecture · PLC capabilities · Expansion Modules in PLC

03

S-7 Controllers and Programming Languages for PLC

TOPICS

Types of S-7 controllers · Addressing of digital I/Os · Siemens communication protocols · Profibus protocol overview · Sink and source concept · CPU scan cycle · PLC programming languages · Programming examples

04

TIA Portal and Programming Languages

TOPICS

- Importance of DI modules
- Cyclic program processing sequence
- PLC selection criteria
- Introduction to TIA Portal
- Hardware configuration and project setup
- PLC and PC communication
- Clock memory application
- Memory reset procedure
- Programming language conversion

05

3 Ex Labs

PLC Operations and Memory Types

TOPICS

- Instruction writing
- Logic operations (AND, OR, NOR, etc.)
- Online diagnostics
- Data types (BIT, BYTE, WORD, DWORD)
- RLO and status concepts
- Load, work, and system memory
- Switch operation examples
- SET-RESET instructions

06

5 Ex Labs

PLC Blocks and Timers

TOPICS

- Comparator block applications
- Program design techniques
- Timer types (pulse, delay, etc.)
- Counter operations
- Comparison functions and examples
- S-7 block types
- Organization blocks and error handling
- Additional Timer biased and Counter combined Logic Problems

07

Block Architecture and Program Structure

TOPICS

Warm, cold, and hot restarts · FB vs FC blocks · Block architecture and editing · Program structure and routine calling · Time-Of-Day and cyclic interrupts · Practical programming examples

08

Ex Lab

Processing of Analog Values

TOPICS

Analog value processing · Analog sensor block diagram · Signal flow from sensor to PLC · 2-wire and 4-wire sensors · Analog module wiring · Engineering value conversion · Norm X and Scale X Function Block

09

Faults and Cross-Reference Function

TOPICS

Functional vs system faults · Forcing I/O variables · Cross-reference usage · Parameter passing · Shared data blocks · Practical fault diagnosis examples

10

Practical Examples and Conclusion

TOPICS

Real-world practical examples · Course review · Conclusion

HANDS-ON ACTIVITIES

Practise What You Learn

#	MODULE	ACTIVITY
05	**PLC Operations and Memory Types**	■ Ex lab 5.1 - 2 Lamps and 3 NO/NC Contact coil Program ■ Ex lab 5.2 - 3 Lamps and 3 NO/NC Contact coil Program using dual Network ■ Ex lab 5.3 - 4 Lamps and 4 NO/NC Contact coil Program using Multiple Branching Network
06	**PLC Blocks and Timers**	■ Ex lab 6.1 - Sequential 2 Motor Control with Delayed Start and Stop Functionality ■ Ex lab 6.2 - Motor Control with Delayed Start and Timed Stop Hold ■ Ex lab 6.3 - Car Parking Control System Using Sensors and Visual Indicator Logic ■ Ex lab 6.4 - Sequenced Conveyor Control with Delayed Start/Stop and Cycle Limitation ■ Ex lab 6.5 - Controlling Multiple Conveyor Belt with ON – OFF Bit Reset emergency stop functionality
08	**Processing of Analog Values**	Ex lab 8.1 - Analog Speed Regulation of Conveyor System through Potentiometer Signal Processing in TIA Portal

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

Learn the Way That Suits You

Classroom Training | Live Online Classes (ILO) | Fly-Me-A-Trainer (FMAT) | Flexi (Self-Paced) | 1-on-1 Training

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