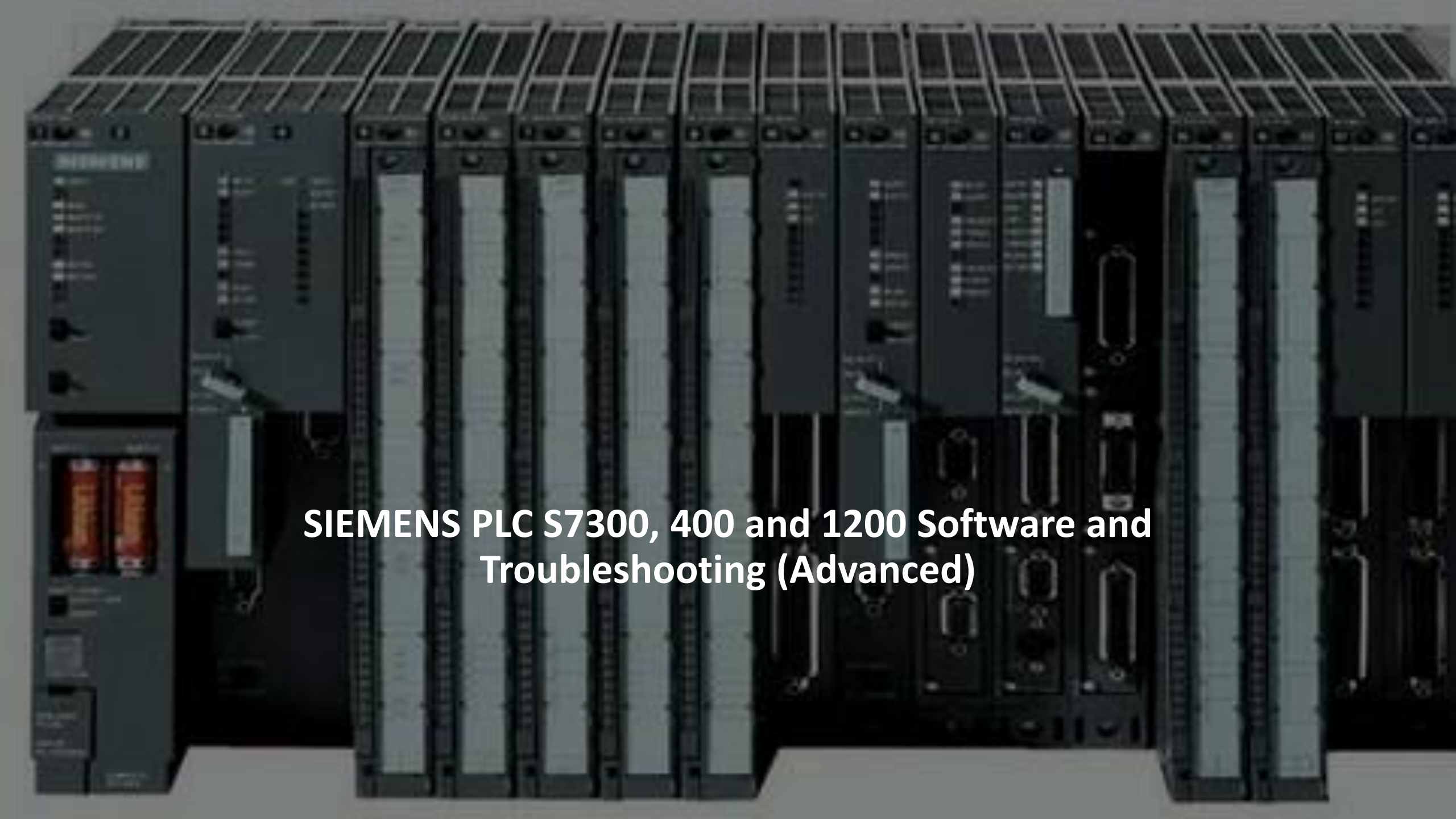

# SIEMENS PLC S7300, 400 and 1200 Software and Troubleshooting (Advanced)

# Introduction

This 5 days course is designed to benefit the participants with practical up-to-date information on the application of PLC's to the automation and process control of plants and factories. It is introducing the configuration & troubleshooting aspects of Siemens PLC S7 series. It aims to give practical advice from experts in the field, to assist correctly plan, programme and install a PLC with a shorter learning curve and more confidence.

# Course objective

**This course aims to enable the participants to:**

- Identify and explain the main design characteristics, internal architecture and operating principles of programmable logic controllers.
- Describe and identify the characteristics of commonly used input and output devices.
- Explain the processing of inputs and outputs by PLCs.
- Describe communication links involved with PLC systems, the protocols and networking methods.
- Develop ladder and function programming for the logic functions AND, OR, NOR, NAND, NOT and XOR.
- Develop ladder programs involving internal relays, timers, counters, shift registers, sequencers and data handling.
- Identify the parts of an electrical machine control diagram including rungs, branches, rails, contacts, and loads.
- Correctly design and draw a simple electrical machine control diagram.
- Recognize the difference between an electronic diagram and an electrical machine diagram.
- Understand the more common machine control terminology.
- Identify safety issues with PLC systems.
- Identify methods used for fault diagnosis, testing and debugging.

The Training Course will

highlight

While this course is ideal for engineers who are new to PLCs, much of the contents and additional material in the extensive manual will be of value to those who already have the basic skills but need a wider perspective for larger and more challenging tasks ahead.
The information contained in this course advances from the basics to challenge even the most experienced engineer in the industry today.
The course is supported by Video demonstrating PLC Programming techniques.

# Training Methods

**This course is designed for:**

- New engineers/tech.
- Senior engineers/tech.
- Process engineers/tech.
- Instrumentation engineers/tech.
- Electrical engineers/tech.

# Course Outline

**Day 1**

**Chapter 1: INTRODUCTION TO PROGRAMMABLE CONTROLLERS**

- Definition
- A Historical Background
- Principles of Operation
- PLCs Versus Other Types of Controls
- Advantages of PLCs

**Number Systems and Codes**

- Number Systems
- Number Conversions
- One's and Two's Complement
- Binary Codes
- Register Word Formats

**Chapter 2: PLC COMPONENTS AND SYSTEMS**

**Processors, the Power Supply, and Programming Devices**

- Processors
- Processor Scan
- Error Checking and Diagnostics
- The System Power Supply
- Programming Devices

# Course Outline

**The Memory System and I/O Interaction**

- Memory Overview
- Memory Types
- Memory Structure and Capacity
- Memory Organization and I/O Interaction
- Configuring the PLC Memory—I/O Addressing
- Memory Considerations

**The Input / Output System**

- I/O Rack Enclosures and Table Mapping
- Remote I/O Systems
- PLC Instructions for Discrete Inputs
- Types of Discrete Inputs
- PLC Instructions for Discrete Outputs
- Discrete Outputs
- Discrete Bypass/Control Stations
- Analog Input/ output Connections
- Instructions for Analog Input/ Output Modules
- Analog Input/ Output Data Representation & Handling

# Course Outline

**Day 2**

**Chapter 3: PLC PROGRAMMING**

**Programming Languages**

- Types of PLC Languages
- Ladder Diagram Format
- Ladder Relay Instructions
- Ladder Relay Programming
- Timers and Counters
- Timer Instructions
- Counter Instructions
- Program/Flow Control Instructions
- Arithmetic Instructions
- Data Manipulation Instructions
- Data Transfer Instructions
- Special Function Instructions
- Network Communication Instructions
- Boolean Mnemonics

**The IEC 1131 Standard and Programming Language**

- IEC 1131-3 Programming Languages
- Sequential Function Chart Programming
- Types of Step Actions
- IEC 1131-3 Software Systems

# Course Outline

**Day 3**

**System Programming and Implementation**

- Control Task Definition
- Control Strategy
- Implementation Guidelines
- Programming Organization and Implementation
- Discrete I/O Control Programming
- Analog I/O Control Programming
- Short Programming Examples

**PLC System Documentation**

- Steps for Documentation
- PLC Documentation Systems

**Case Studies “Siemens S7 & Allen Bradley”**

# Course Outline

**Day 4**

**Chapter 4: PLC COMMUNICATION & NETWORKS**

**Local Area Networks**

- Principles of Local Area Networks
- Network Topologies
- Network Access Methods
- Communication Media
- Understanding Network Specifications
- Network Protocols
- Network Testing and Troubleshooting

**I/O Bus Networks**

- Types of I/O Bus Networks
- Advantages of I/O Bus Networks
- Device Bus Networks
- Process Bus Networks
- I/O Bus Installation and Wiring Connections

**Case Studies “Siemens S7 & Allen Bradley”**

# Course Outline

**Chapter 5: PLC Installation, Start-up, Troubleshooting and Maintenance**

**PLC Start-Up and Maintenance**

- PLC System Layout
- Power Requirements and Safety Circuitry
- Noise, Heat, and Voltage Considerations
- I/O Installation, Wiring, and Precautions
- PLC Start-Up and Checking Procedures
- PLC System Maintenance
- Troubleshooting the PLC System

**System Selection Guidelines**

- PLC Sizes and Scopes of Applications
- Process Control System Definition
- Other Considerations

**Case Studies “Siemens S7 & Allen Bradley”**