COURSE OVERVIEW IE0920

Programmable Logic Controller (PLC) Operations, Maintenance and Troubleshooting (Siemens)

Course Title

Programmable Logic Controller (PLC) Operations, Maintenance and Troubleshooting (Siemens)

Course Reference

IE0920

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs

Course Date/Venue

Session(s)	Date	Venue
1	June 29-July 03, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
2	August 18-22, 2025	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
3	October 19-23, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
4	December 22-26, 2025	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of Programmable Logic Controller (PLC) Operations, Maintenance and Troubleshooting (Siemens). It covers the PLC fundamentals and applications, Siemens PLC system, hardware components and configuration; the wiring and field connections, PLC input/output modules and programming languages; the ladder logic programming with TIA portal, function blocks and structured programming; the data types and memory allocation; and the analog signal processing, human-machine interface (HMI) fundamentals and creating HMI screens in TIA portal.

During this interactive course, participants will learn the communication protocols and networking, SCADA integration basics and simulation and diagnostics; the PLC maintenance best practices, diagnostics and fault identification; the common PLC hardware failures, program backup and recovery and control panel inspection and testing; the structured approach to diagnostics, intermittent fault handling, loop checking strategies and root cause analysis techniques; the PLC and field device troubleshooting, program debugging and monitoring; and the advanced troubleshooting scenarios and safety and risk management.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain a comprehensive knowledge on programmable logic controller (PLC) operations, maintenance and troubleshooting (Siemens)
- Discuss PLC fundamentals and applications, Siemens PLC system and hardware components and configuration
- Describe wiring and field connections, PLC input/output modules and programming languages
- Identify ladder logic programming with TIA portal, function blocks and structured programming, data types and memory allocation
- Illustrate analog signal processing, human-machine interface (HMI) fundamentals and creating HMI screens in TIA portal
- Apply communication protocols and networking, SCADA integration basics and simulation and diagnostics
- Employ PLC maintenance best practices, diagnostics and fault identification
- Identify common PLC hardware failures and apply program backup and recovery and control panel inspection and testing
- Carryout structured approach to diagnostics, intermittent fault handling, loop checking strategies and root cause analysis techniques
- Apply PLC and field device troubleshooting, program debugging and monitoring, advanced troubleshooting scenarios and safety and risk management

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

this course provides an overview of all significant aspects and considerations of programmable logic controller (PLC) operations, maintenance and troubleshooting (siemens) for instrumentation and control engineers, superintendents, supervisors and technicians, process control and automation engineers and technicians, electrical engineers, design engineers and consulting engineers, process control staff, trades staff working with or near PLC's, instrumentation technicians, process control engineers, engineering managers and DCS, SCADA and PLC personnel.

Course Certificate(s)
Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations
Certificates are accredited by the following international accreditation organizations: -

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Course Fee
US$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Sydney Thoresson, PE, BSc, is a **Senior Electrical & Instrumentation Engineer** with over **40 years** of extensive experience within the **Petrochemical**, **Utilities**, **Oil**, **Gas** and **Power** industries. His specialization highly evolves in **Process Control Instrumentation**, **Process Instrumentation & Control**, **Process Control**, **Instrumentation**, **Troubleshooting** & Problem Solving, Process **Instrumentation** and Control Techniques, **Instrumentation** for Process Optimization and Control, Process Automation and **Instrumentation** Systems Integration, Troubleshooting in Process Control Systems**,** Process Control & Safeguarding, **Troubleshooting Instrumentation** and Control Systems, GC Processes **Troubleshooting** and Control Systems, Practical **Troubleshooting** and Repair of Electronic Circuits**,** Process Control, **Troubleshooting** & **Problem Solving.** Process Control (**PCI**) & Safeguarding, **Control Loop & Valve Tuning**, **Controller Maintenance** Procedures, High Integrity Protection Systems (**HIPS**), **Instrument Calibration & Maintenance**, **Instrumented Safety Systems**, **Compressor Control & Protection**, **Control Systems**, Programmable Logic Controllers (**PLC**), **SCADA System**, **PLC & SCADA** - Automation & Process Control, **PLC & SCADA** Systems Application, Technical **DCS/SCADA**, **PLC-SIMATIC S7 300/400**: Configuration, Programming and Troubleshooting, **PLC, Telemetry and SCADA** Technologies, Cyber Security of Industrial Control System (**PLC, DCS, SCADA & IED**), Basics of **Instrumentation Control System, DCS**, **Distributed Control System** - Operations & Techniques, Distributed Control System (**DCS**) Principles, Applications, Selection & Troubleshooting, Distributed Control Systems (**DCS**) especially in **Honeywell DCS**, **H&B DCS**, **Modicon, Siemens**, **Telemecanique**, **Wonderware** and **Adrioit,** Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), **Emergency Shutdown** System, Variable Frequency Drive (**VFD**), **Process Control & Safeguarding**, **Field Instrumentation**, **Instrumented Protective Devices** Maintenance & Testing, Instrumented Protective Function (**IPF**), **Refining & Rotating Equipment**, **Equipment Operations**, **Short Circuit Calculation**, **Voltage Drop Calculation**, **Lighting Calculation**, **Hazardous Area Classification**, **Intrinsic Safety**, **Liquid & Gas Flowmetering**, **Custody Measurement**, **Ultrasonic Flowmetering**, **Loss Control**, **Gas Measurement**, **Flowmetering & Custody Measurement**, **Multiphase Flowmetering**, **Measurement and Control**, **Mass Measuring System Batching** (**Philips**), Arc Furnace Automation-Ferro Alloys, Walking Beam Furnace, Blast Furnace, Billet Casting Station, Cement Kiln Automation, Factory Automation and Quality Assurance Accreditation (**ISO 9000** and **Standard BS 5750**). Further, he is also well-versed in **Electrical Safety**, **Electrical Hazards Assessment**, **Electrical Equipment**, **Personal Protective Equipment**, Log-Out & Tag-Out (**LOTO**), **ALARP & LOPA** Methods, Confined Workspaces, Power **Quality**, Power **Network**, Power **Distribution**, **Distribution Systems**, **Power Systems Control**, **Power Systems Security**, Power **Electronics**, Electrical **Substations**, **UPS** & **Battery System**, **Earthing & Grounding**, Power **Generation**, **Protective Systems**, **Electrical Generators**, **Power** & **Distribution Transformers**, **Electrical Motors**, **Switchgears**, **Transformers**, **AC** & **DC Drives**, **Variable Speed Drives** & **Generators** and **Generator Protection**. He is currently the **Projects Manager** wherein he manages projects in the field of electrical and automation engineering and in-charge of various process hazard analysis, fault task analysis, FMEA and HAZOP study.

During Mr. Thoresson's career life, he has gained his thorough and practical experience through various challenging positions and dedication as the **Contracts & Projects Manager**, **Managing Director**, **Technical Director**, **Divisional Manager**, **Plant Automation Engineer**, **Senior Consulting Engineer**, **Senior Systems Engineer**, **Electrical & Instrumentation Engineer**, **Consulting Engineer**, **Service Engineer** and **Section Leader** from several international companies such as **Philips**, **FEDMIS**, **AEG**, **DAVY International**, **BOSCH**, **Billiton** and **Endress/Hauser**.

Mr. Thoresson is a **Registered Professional Engineering Technologist** and has a **Bachelor's** degree in **Electrical & Electronics Engineering** and a **National Diploma** in **Radio Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and an active member of the International Society of Automation (**ISA**) and the Society for Automation, Instrumentation, Measurement and Control (**SAIMC**). He has further delivered numerous trainings, courses, seminars, conferences and workshops worldwide.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***PLC Fundamentals & Applications*** *Evolution and Role of PLCs in Industrial Automation • Discrete versus Analog Control • Types of PLCs (Compact, Modular, Rack-Based) • Applications in Various Industries*
0930 - 0945	*Break*
0945 – 1045	***Siemens PLC System Overview*** *SIMATIC Product Family (S7-300, S7-400, S7-1200, S7-1500) • CPU Types and Features • Memory Organization and Scan Cycle • Advantages of Siemens PLCs*
1045 - 1145	***Hardware Components & Configuration*** *CPU, I/O Modules, Communication Processors • Power Supply and Wiring Guidelines • Mounting and Grounding Practices • Module Addressing and Diagnostics*
1145 - 1230	***Wiring & Field Connections*** *Digital and Analog Signal Wiring • Sensor and Actuator Interfacing • Noise Reduction and Shielding Techniques • Input/Output Testing and Verification*
1230 – 1245	*Break*
1245 – 1330	***Understanding PLC Input/Output Modules*** *Digital Input/Output Module Operation • Analog Input/Output Configuration • Signal Conditioning • Troubleshooting Faulty I/O Modules*
1330 - 1420	***Basics of TIA Portal Software*** *TIA Portal Installation and Interface • Creating a New Project • Hardware Configuration in the Project Tree • Navigating Siemens Software Tools*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Programming Languages (IEC 61131-3)*** *Ladder Logic (LAD) Basics • Function Block Diagram (FBD) • Structured Text (ST) Overview • Applications and Selection Criteria*
0830 – 0930	***Ladder Logic Programming with TIA Portal*** *Basic Instructions (Contacts, Coils) • Timer and Counter Functions • Latching and Interlocking Logic • Simulation of Ladder Diagrams*
0930 - 0945	*Break*
0945 – 1130	***Function Blocks & Structured Programming*** *Creating User-Defined Functions (UDF) • Reusable Code Blocks • Block Call Techniques • Passing Parameters Between Blocks*
1130 - 1230	***Data Types & Memory Allocation*** *Boolean, Integer, Real, and Timer Data Types • Addressing Conventions (I, Q, M, DB) • Working with Data Blocks • Best Practices for Memory Optimization*
1230 - 1245	*Break*
1245 - 1330	***Analog Signal Processing*** *Scaling and Normalization of Analog Inputs • Engineering Unit Conversion • Analog Alarms and Limits • PID Control Basics in Siemens PLC*
1330 - 1420	***Programming Exercises (Hands-On)*** *Start/Stop Motor Logic • Traffic Light Simulation • Tank Level Control • Alarm Handling Logic*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Human-Machine Interface (HMI) Fundamentals*** *Purpose and Types of HMI • Siemens HMI Products (KTP, Comfort Panels) • Touchscreen versus Push-Button Interfaces • HMI Architecture and Connection*
0830 – 0930	***Creating HMI Screens in TIA Portal*** *Designing Graphical Interfaces • Linking Tags to PLC Variables • Alarm and Event Displays • Trend and Data Logging Functions*
0930 - 0945	*Break*
0945 – 1130	***Communication Protocols & Networking*** *PROFIBUS and PROFINET Overview • Ethernet/IP and Modbus Support • Communication Configuration in TIA Portal • Network Troubleshooting Basics*
1130 - 1230	***SCADA Integration Basics*** *Overview of SCADA Systems • Communication Setup with SCADA • Data Acquisition and Control • Logging and Historical Trending*
1230 - 1245	*Break*
1245 - 1330	***Simulation & Diagnostics*** *Online/Offline Simulation in TIA Portal • Diagnostic Buffer Analysis • Cross-Reference and Force Functions • Signal Status and Monitoring Tools*

1330 - 1420	***Practical Lab: HMI + PLC Integration*** *Develop and Test a Control + Display Interface • Simulate PLC Inputs with HMI Controls • Monitor Real-Time Process Status • Alarm Acknowledgment and Reset System*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***PLC Maintenance Best Practices*** *Routine Maintenance Schedules • Cleaning, Inspection, and Connection Checks • Backup and Restoration Procedures • Updating Firmware and Software*
0830 – 0930	***Diagnostics & Fault Identification*** *LED Status Indicators • Diagnostic Buffer Analysis • Fault Code Interpretation • Trending and System Logs*
0930 - 0945	*Break*
0945 – 1130	***Common PLC Hardware Failures*** *Power Supply Issues • I/O Module Failures • Communication Breakdowns • CPU Failure Scenarios*
1130 - 1230	***Program Backup & Recovery*** *Backup Using TIA Portal • Upload/Download of Project Files • Version Control and Documentation • Restoring Corrupted Programs*
1230 - 1245	*Break*
1245 - 1330	***Control Panel Inspection & Testing*** *Thermal Scanning and Hot Spot Detection • Terminal Torque Check • Insulation Resistance Testing • Power Quality Checks*
1330 - 1420	***Case Studies in Maintenance*** *Preventive vs. Reactive Maintenance • Downtime Analysis • Maintenance KPIs • Cost-Effective PLC Lifecycle Management*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Troubleshooting Methodology*** *Structured Approach to Diagnostics • Intermittent Fault Handling • Loop Checking Strategies • Root Cause Analysis Techniques*
0830 – 0930	***PLC & Field Device Troubleshooting*** *Signal Tracing Using Multimeter • Sensor/Actuator Loop Verification • Replacing I/O Modules • Checking Field Cabling*
0930 - 0945	*Break*
0945 – 1100	***Program Debugging & Monitoring*** *Breakpoint and Watch Functions • Real-Time Monitoring in TIA Portal • Cross-Reference Tracking • Logic Forcing for Troubleshooting*

1100 – 1200	***Advanced Troubleshooting Scenarios*** *Communication Link Failure • Analog Value Fluctuations • PID Control Loop Instability • Motor Control Interlock Issues*
1200 - 1215	*Break*
1215 – 1230	***Safety & Risk Management*** *Lockout/Tagout (LOTO) Procedures • Working with Live Systems Safely • Risk Assessment and Mitigation • Safety PLCs and Fail-Safe Design*
1230 - 1345	***Capstone Practical Assessment*** *Troubleshoot a Simulated PLC System Fault • Program Modification for New Process Requirement • HMI Update and Test Run • Final Evaluation and Feedback*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using one of our state-of-the-art simulators "Allen Bradley SLC 500", "AB Micrologix 1000 (Digital or Analog)", "AB SLC5/03", "AB WS5610 PLC", "Siemens S7-1200", "Siemens S7-400", "Siemens SIMATIC S7-300", "Siemens S7-200", "GE Fanuc Series 90-30 PLC", "Siemens SIMATIC Step 7 Professional Software", "HMI SCADA" and "PLCLogix 5000 Software".

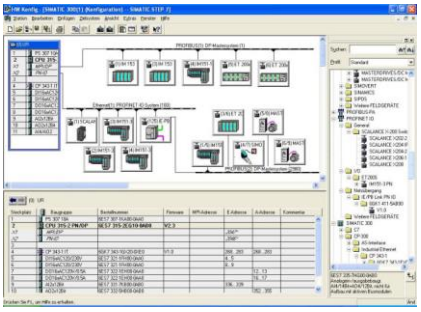
Siemens S7-1200 Simulator

Siemens S7-400 Simulator

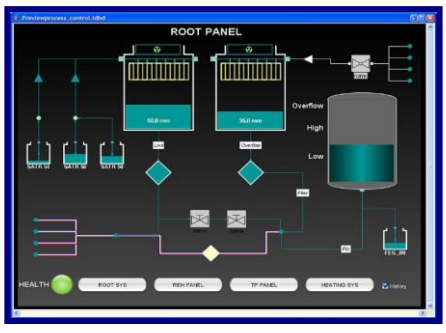
Siemens SIMATIC S7-300 Simulator

Siemens S7-200 Simulator

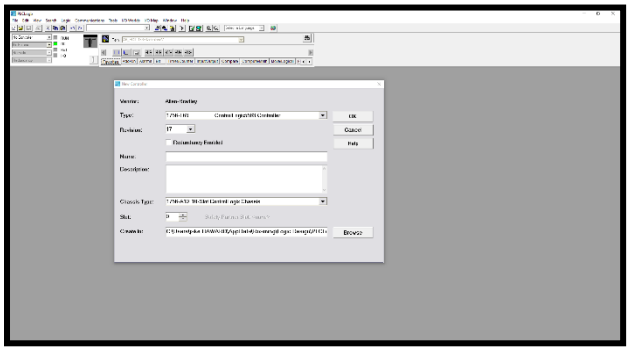
GE Fanuc Series 90-30 PLC Simulator

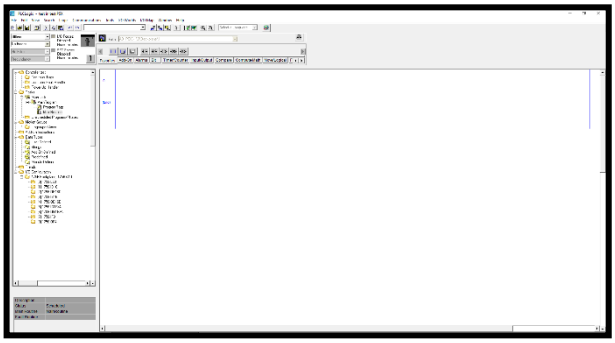


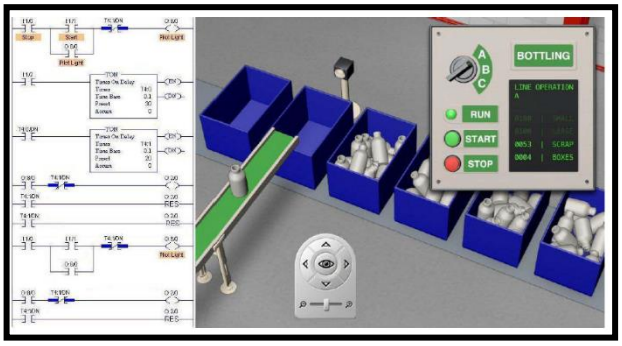
Siemens SIMATIC Step 7 Professional Software

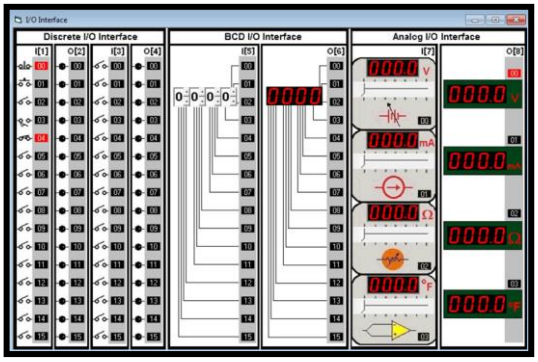


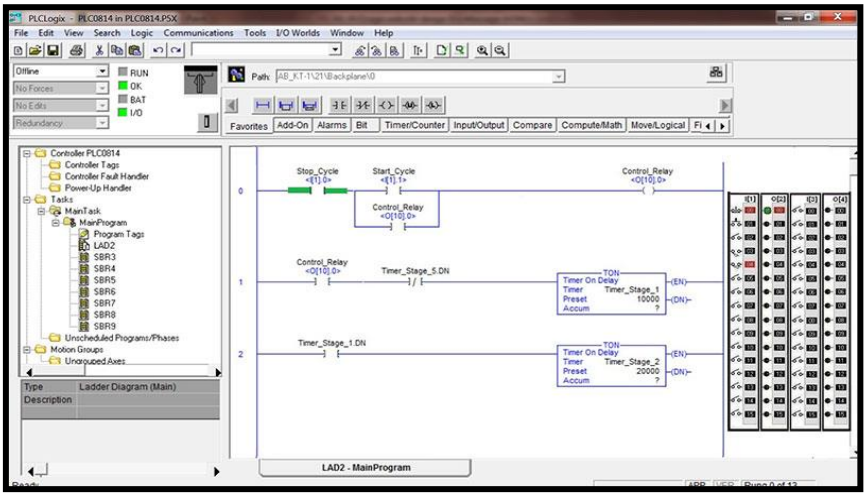
HMI SCADA











PLCLogix 5000 Software

Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org