

COURSE OVERVIEW IE0030
Process Control & Instrumentation

Course Title

Process Control & Instrumentation

Course Reference

IE0030

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs

Course Date/Venue



Session(s)	Date	Venue
1	February 18-22, 2024	Boardroom, Warwick Hotel Doha, Doha, Qatar
2	March 03-07, 2024	
3	May 26-30, 2024	
4	September 08-12, 2024	
5	December 08-12, 2024	

Course Description



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



Process control is becoming an increasingly important engineering topic, since the subject plays a crucial role in the design, operation and maintenance in areas such as power plants and chemical and industrial process plants. Control systems have advanced dramatically during the last decade. They become more modular and more sophisticated offering a vast variety of control functions for all the systems that operate within a modern "intelligent" facility. Enhanced functionality of the automation systems also means more complexity, interactive strategies, new technologies and systems management with resulting better control and improved reliability.



The course is designed to update participants with the latest technologies in instrumentation and process control. The course will describe the various types of sensors relating to level, pressure, flow and temperature. Also included is an in-depth look at control valves, actuators with associated accessories together with practical valve sizing and selection techniques. The topics of digital field communications and Smart transmitters form an integral part of this course.

A major part of the course is devoted to a detailed exposition of currently used control valves, the associated terminology, valve performance, valve and actuator types, control valve accessories as well as to the correct selection and sizing of control valves for a wide range of applications.

The course addresses the important issues related to valve installation and maintenance. In addition, this training course also utilizes an extensive collection of state-of-the-art, externally generated process management and video material concerned with all aspects of plant management, including smart wireless solutions to the collection of plant data. In addition, the subjects of digital control systems will be discussed with sections on Distributed Control Systems (DCS), Programmable Logic Controllers (PLC), SCADA systems and Safety Instrumented Systems (SIS).

Course Objectives

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

- Apply an in-depth knowledge and skills in process control and instrumentation
- List down the different technologies currently in use in pressure, temperature, level flow measurement
- Identify the types of control valve and use a system approach in actuator selection
- Determine the various process considerations for the instrumentation for industrial applications
- Review and apply the different types of control loop strategies and identify the features and application of Distributed Control System (DCS)
- Discuss the system components and operation of the Programmable Logic Controllers (PLC) and apply the configuration of the SCADA systems
- Maintain control systems for rotating equipment and acquire knowledge on Process Safeguarding including safety instrumented systems (SIS), safety integrity level (SIL) and loop safety considerations
- Identify the various trends in flow calibration and apply meter proving
- Maintain field instruments, become acquainted with field communications and employ proper testing and commissioning of field instruments

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 for all significant aspects and considerations of process control and instrumentation for process control engineers and supervisors, instrumentation and control system engineers, automation engineers, instrumentation engineers and technologists. Further, process engineers, electrical engineers and supervisors and those involved in the design, implementation and upgrading of industrial control systems will also benefit from the practical aspects of this course.



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:-

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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.

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.

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British Accreditation Council (BAC)

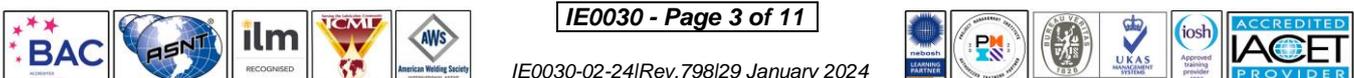
Haward Technology is accredited by the **British Accreditation Council for Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As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

Course Fee

US\$ 6,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Accommodation

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





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 Electrical Drawing and Schematics, Hazardous Area Classification, Intrinsic Safety, Liquid & Gas Flowmetering, Custody Measurement, Ultrasonic Flowmetering, Loss Control, Gas Measurement, Process Control Instrumentation, Compressor Control & Protection, Control Systems, Programmable Logic Controllers (PLC), SCADA, Distributed Control Systems (DCS) especially in Honeywell DCS, H&B DCS, Modicon, Siemens, Telemecanique, Wonderware and Adroit. Moreover, he has vast experience in the field of Safety Instrumented Systems (SIS), Safety Integrity Level (SIL), Emergency Shutdown (ESD), 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).

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

Mr. Thoresson is a **Registered Professional Engineering Technologist** and has a **National Higher Diploma (NHD) & a National Diploma in Radio Engineering** from the **Witwatersrand Technikon**. Further, he is a **Certified Instructor/Trainer, a Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)**, an active member of the **International Society of Automation (ISA)** and the **Society for Automation, Instrumentation, Measurement and Control (SAIMC)**.

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.





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 - 0900	Introduction Course Content • Objectives of Course
0900 - 0930	Introduction to Process Control Control History • The Process of Control • Basic Measurement Definitions • P&ID Symbols • Control Loops • Typical Applications
0930 - 0945	Break
0945 - 1100	Pressure Measurement Basic Principles • Definition of Terminology • Pressure Elements • Pressure Transducers • Installation Considerations • Summary
1100 - 1230	Temperature Measurement Principles • Thermocouples • RTD's • Thermistors Thermometer • Infra-Red Thermometry • Installation Considerations
1230 - 1245	Break
1230 - 1330	Level Measurement Main Types • Sight Glass Method • Buoyancy Tape Systems • Hydrostatic Pressure • Ultrasonic Measurement • Radar Measurement • Electrical Measurement • Installation Considerations
1330 - 1420	Video Presentation Radar Level Measurement
1420 - 1430	Recap
1430	Lunch & End of Day One

Day 2

0730 - 0830	Flow Measurement Differential Pressure Flowmeters • Oscillatory Flow Measurement • Non-Intrusive Flowmeters • Mass Flow Meters • Positive Displacement Meters • Installation Considerations • Selection Guidelines
0830 - 0930	Video Presentation Coriolis Effect Mass Flowmeter
0930 - 0945	Break
0945 - 1100	Control Valve Types Rotary • Linear • Control Valve Selection
1100 - 1230	Actuator Selection Introduction • Types of Actuators • Linear Actuators • Rotary Actuators • Actuator Forces • Positioners • Fail Safe Actuators
1230 - 1245	Break
1245 - 1330	Process Considerations End Connections • Face to Face Criteria • Materials Selection • Modes of Failure • Leakage Rates
1330 - 1420	Practical Session Control Valve Sizing
1420 - 1430	Recap
1430	Lunch & End of Day Two





Day 3

0730 – 0830	Control Loop Strategies Introduction • Variables • Basic Elements • Manual Control • Feedback Control • System Responses • ON-OFF Control • Three Term Control
0830 – 0930	Video Presentation Three Term Control
0930 – 0945	Break
0945 – 1030	Distributed Control Systems Introduction • Traditional Process Controllers • Three Term Control • Architecture of Controllers • Software • Programming • Execution Time • Programming vs. Configuration • Function Blocks
1030 – 1130	Video Presentation Distributed Control Systems
1130 – 1230	Programmable Logic Controllers Introduction • Today's Position • Principles of Operation • System Components • I/O Interfaces • Configuration
1230 – 1245	Break
1245 – 1345	SCADA Systems Basic Definitions • Level of Hierarchy • Communication Systems • SCADA Configuration
1345 – 1420	Maintain Control Systems for Rotating Equipment
1420 – 1430	Recap
1430	Lunch & End of Day Three

Day 4

0730 – 0830	Safety Instrumented Systems (SIS) Introduction • Overview • Ensuring Safety • Layers of Safety • Factors Affecting Safety • Anatomy of a Disaster • Disaster Prevention
0830 – 0930	Safety Integrity Level (SIL) Introduction • Definition • Selection Procedure • Practical Examples
0930 – 0945	Break
0945 – 1100	Loop Safety Considerations Intrinsic Safety • Explosion-Proof • Approval Standards • Oxygen Service
1100 – 1230	Flow Calibration General • Trends in Calibration • Types of Calibration Test Rigs • In-Situ Calibration • Turbine Meters
1230 – 1245	Break
1245 – 1420	Meter Proving Practical Exercise
1420 – 1430	Recap
1430	Lunch & End of Day Four

Day 5

0730 – 0800	Field Communications Analogue Signals • Digital Communications • Fieldbus Technologies • Future Trends
0800 – 0830	Maintain Field Instruments
0830 – 0900	Video Presentation HART Protocol
0900 – 0930	Testing & Commissioning Field Instruments
0930 – 0945	Break





0945 – 1100	Case Studies <i>Bhopal Gas Tragedy • Piper Alpha Disaster • Chernobyl Catastrophe • Buncefield Oil Depot Explosion</i>
1100 – 1230	Video Presentation <i>BP Texas City – Refinery Explosion</i>
1230 – 1245	<i>Break</i>
1245 - 1345	Addendums <i>Review of Course • Valve Sizing Exercise • Choke Valves • Any Other Subjects</i>
1345 – 1400	Review Session & Course Conclusion
1400 – 1415	POST-TEST
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch & End of Course</i>





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”, “Gas Ultrasonic Meter Sizing Tool”, “Liquid Turbine Meter and Control Valve Sizing Tool”, “Liquid Ultrasonic Meter Sizing Tool” , “Orifice Flow Calculator”, “Automation Simulator” and “PLCLogix 5000 Software”.



Allen Bradley SLC 500 Simulator



Allen Bradley Micrologix 1000 Simulator (Digital)



Allen Bradley Micrologix 1000 Simulator (Analog)



Allen Bradley SLC 5/03



Allen Bradley WS5610 PLC Simulator PLC5



Siemens S7-1200 Simulator



Siemens S7-400 Simulator



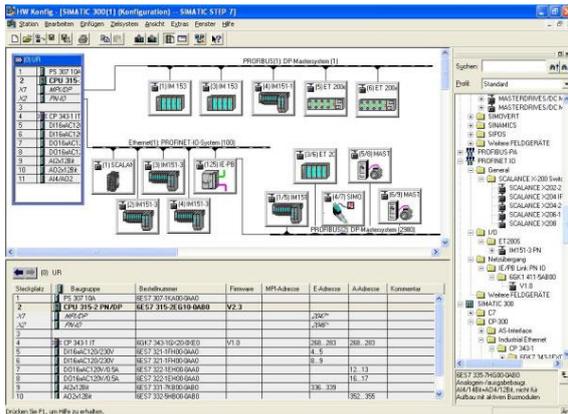
Siemens SIMATIC S7-300



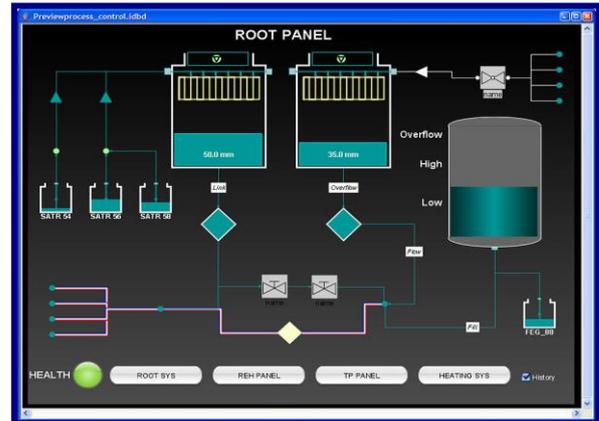
Siemens S7-200 Simulator



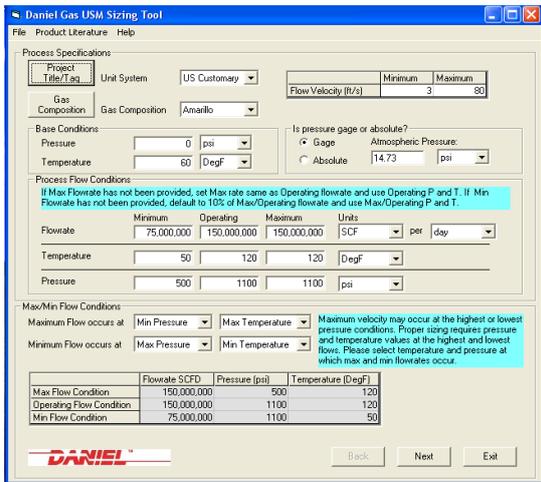
GE Fanuc Series 90-30 PLC Simulator



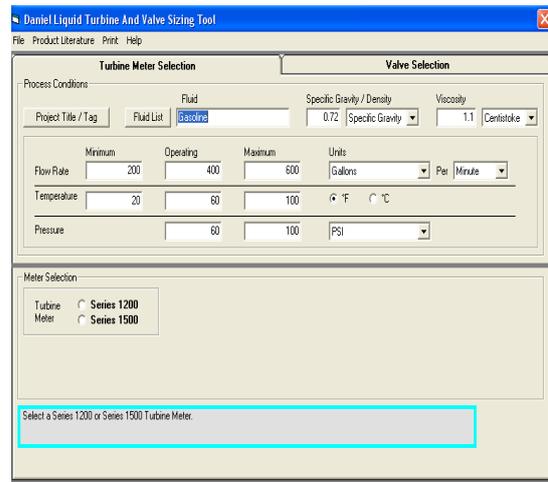
Siemens SIMATIC Step 7 Professional Software



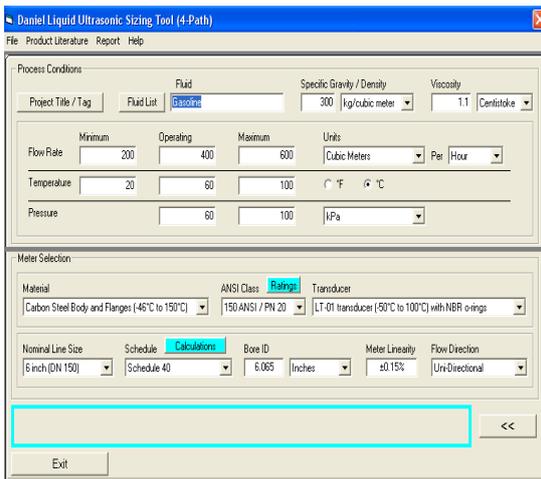
HMI SCADA



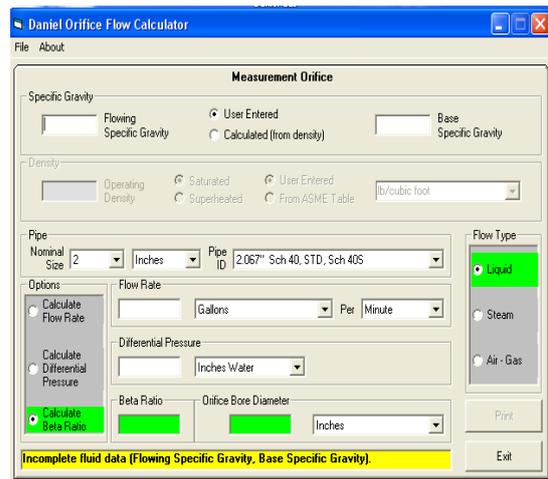
Gas Ultrasonic Meter (USM) Sizing Tool Simulator



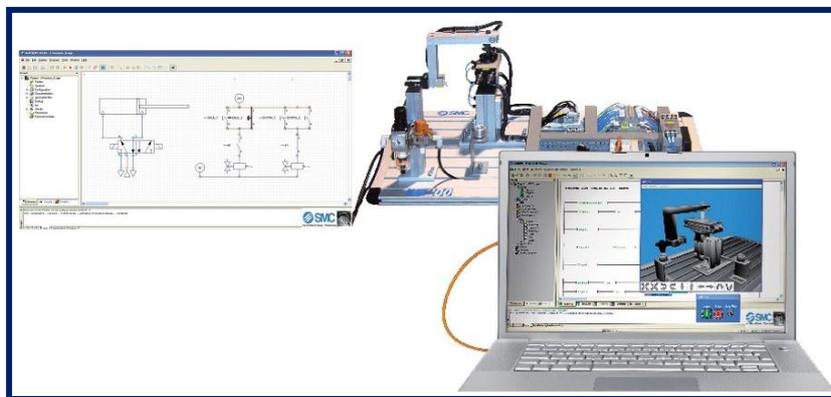
Liquid Turbine Meter and Control Valve Sizing Tool Simulator



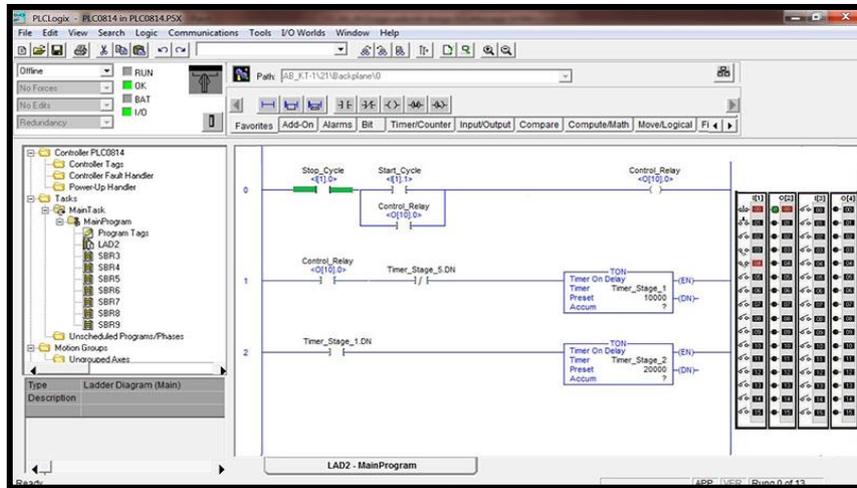
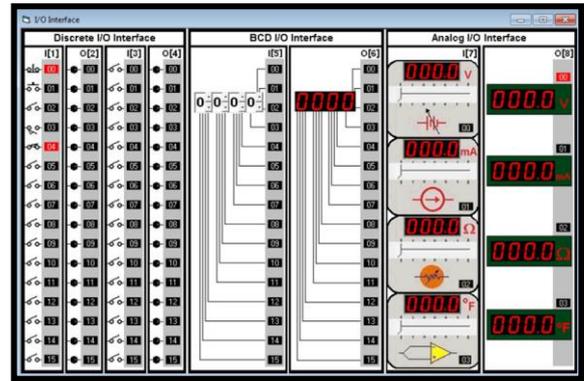
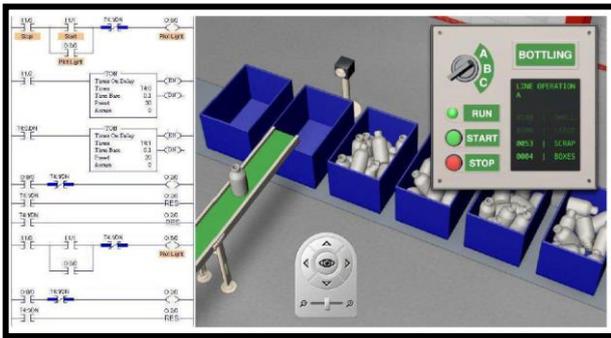
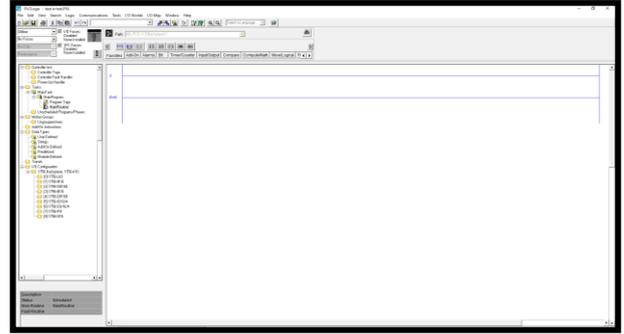
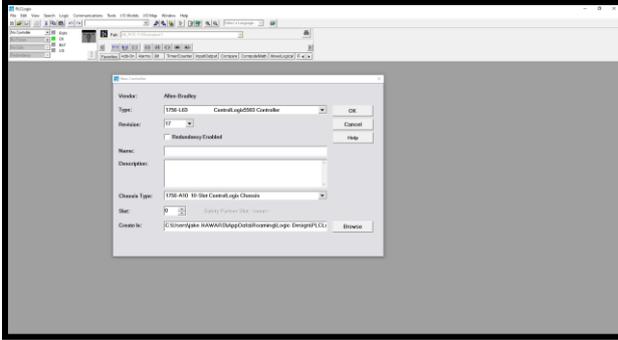
Liquid Ultrasonic Meter Sizing Tool Simulator



Orifice Flow Calculator Simulator



AutoSIM – 200 Automation Simulator



PLCLogix 5000 Software

Course Coordinator

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