

**COURSE OVERVIEW IE0030**  
**Process Control & Instrumentation**

**Course Title**

Process Control & Instrumentation

**Course Date/Venue**

December 08-12, 2024/Waha Meeting Room,  
 Pullman Doha West Bay, Doha, Qatar

**Course Reference**

IE0030

**Course Duration/Credits**

Five days/3.0 CEUs/30 PDHs



**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:-


- 

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.

- 

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.





### 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. Barry Pretorius** is a **Senior Instrumentation Engineer** with almost **45** years of extensive experience within the **Oil, Gas, Petrochemical, Refinery & Power** industries. His expertise widely covers in the areas of **Process Control, Instrumentation**, Programmable Logic Controller (PLC), **Siemens PLC Simatic S7-400/S7-300/S7-200, PLC & SCADA** for Automation & Process Control, **Cyber Security Practitioner, Cyber Security** of Industrial Control System, **IT Cyber Security Best Practices, Cybersecurity Fundamentals, Ethical Hacking & Penetration Testing, Cybersecurity Risk Management, Cybersecurity Threat Intelligence, OT Whitelisting** for Better Industrial Control System Defense, **NESA Standard and Compliance Workshop, OT, Cyber Attacks Awareness - Malware/Ransom Ware / Virus /Trojan/ Phishing, Information Security Manager, Security System Installation and Maintenance, Security of Distributed Control System (DCS), Safeguarding & Security, Artificial Intelligence, Allen Bradley PLC Programing and Hardware Trouble Shooting, Schneider SCADA System, Wonder Ware, Emerson, Honeywell, Honeywell Safety Manager PLC, Yokogawa, Advanced DCS Yokogawa, Endress & Hauser, Field Commissioning and Start up Testing Pre Operations, System Factory Acceptance Test (FAT), System Site Acceptance Test (SAT), SCADA HMI & PLC Control Logic, Implementation, Systems Testing, Commissioning and Startup, Foxboro DCS & Triconics, SIS Systems, Drives, Motion Control, Hydraulics, Pneumatics and Control Systems Engineering, Electrical & Automation Control Systems, HV/MV Switchgear, LV & MV Switchgears & Circuit Breakers, High Voltage Electrical Safety, LV & HV Electrical System, HV Equipment Inspection & Maintenance, LV Distribution Switchgear & Equipment, Electrical Safety, Electrical Maintenance, Transformers, Medium & High Voltage Equipment, Circuit Breakers, Cable & Overhead Line Troubleshooting & Maintenance, Electrical Drawing & Schematics, Voltage Distribution, Power Distribution, Filters, Automation System, Electrical Variable Speed Drives, Power Systems, Power Generation, Diesel Generators, Power Stations, Uninterruptible Power Systems (UPS), Battery Chargers, AC & DC Transmission, CCTV Installation, Data & Fire Alarm System, Evacuation Systems and Electrical Motors & Variable Speed Drives, & Control of Electrical and Electronic devices.**

During Mr. Pretorius's career life, he has gained his practical experience through several significant positions and dedication as the **Senior Technical Analyst, Team Leader, Pre-operations Startup Engineer, Automation System's Software Manager, Automation System's Senior Project Engineer, PLC Specialist, Site Manager, Senior Project & Commissioning Engineer, Technical Director, Project Engineer, Radio Technician, A T E Technician** and **Senior Instructor/Trainer** from various companies like the ADNOC Sour Gas, Ras Al Khair Aluminum Smelter, Johnson Matthey Pty. Ltd, Craigcor Engineering, Unitronics South Africa Pty (Ltd), Bridgestone/Firestone South Africa Pty (Ltd) and South African Defense Force.

Mr. Pretorius's has a Higher Diploma in **Electrical Engineering Heavy Current**. Further, he is a **Certified Instructor/Trainer** and delivered numerous trainings, courses, workshops, seminars and conferences internationally.



**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: Sunday, 08<sup>th</sup> of December 2024**

0730 - 0800	Registration & Coffee
0800 - 0815	Welcome & Introduction
0815 - 0830	<b>PRE-TEST</b>
0830 - 0900	<b>Introduction</b> Course Content • Objectives of Course
0900 - 0930	<b>Introduction to Process Control</b> Control History • The Process of Control • Basic Measurement Definitions • P&ID Symbols • Control Loops • Typical Applications
0930 - 0945	Break
0945 - 1100	<b>Pressure Measurement</b> Basic Principles • Definition of Terminology • Pressure Elements • Pressure Transducers • Installation Considerations • Summary
1100 - 1230	<b>Temperature Measurement</b> Principles • Thermocouples • RTD's • Thermistors Thermometer • Infra-Red Thermometry • Installation Considerations
1230 - 1245	Break
1230 - 1330	<b>Level Measurement</b> Main Types • Sight Glass Method • Buoyancy Tape Systems • Hydrostatic Pressure • Ultrasonic Measurement • Radar Measurement • Electrical Measurement • Installation Considerations
1330 - 1420	<b>Video Presentation</b> Radar Level Measurement
1420 - 1430	<b>Recap</b> 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: Monday, 09<sup>th</sup> of December 2024**

0730 - 0830	<b>Flow Measurement</b> Differential Pressure Flowmeters • Oscillatory Flow Measurement • Non-Intrusive Flowmeters • Mass Flow Meters • Positive Displacement Meters • Installation Considerations • Selection Guidelines
0830 - 0930	<b>Video Presentation</b> Coriolis Effect Mass Flowmeter
0930 - 0945	Break
0945 - 1100	<b>Control Valve Types</b> Rotary • Linear • Control Valve Selection
1100 - 1230	<b>Actuator Selection</b> Introduction • Types of Actuators • Linear Actuators • Rotary Actuators • Actuator Forces • Positioners • Fail Safe Actuators



1230 - 1245	Break
1245 - 1330	<b>Process Considerations</b> End Connections • Face to Face Criteria • Materials Selection • Modes of Failure • Leakage Rates
1330 - 1420	<b>Practical Session</b> Control Valve Sizing
1420 - 1430	<b>Recap</b> 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: Tuesday, 10<sup>th</sup> of December 2024**

0730 - 0830	<b>Control Loop Strategies</b> Introduction • Variables • Basic Elements • Manual Control • Feedback Control • System Responses • ON-OFF Control • Three Term Control
0830 - 0930	<b>Video Presentation</b> Three Term Control
0930 - 0945	Break
0945 - 1030	<b>Distributed Control Systems</b> Introduction • Traditional Process Controllers • Three Term Control • Architecture of Controllers • Software • Programming • Execution Time • Programming vs. Configuration • Function Blocks
1030 - 1130	<b>Video Presentation</b> Distributed Control Systems
1130 - 1230	<b>Programmable Logic Controllers</b> Introduction • Today's Position • Principles of Operation • System Components • I/O Interfaces • Configuration
1230 - 1245	Break
1245 - 1345	<b>SCADA Systems</b> Basic Definitions • Level of Hierarchy • Communication Systems • SCADA Configuration
1345 - 1420	<b>Maintain Control Systems for Rotating Equipment</b>
1420 - 1430	<b>Recap</b> 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: Wednesday, 11<sup>th</sup> of December 2024**

0730 - 0830	<b>Safety Instrumented Systems (SIS)</b> Introduction • Overview • Ensuring Safety • Layers of Safety • Factors Affecting Safety • Anatomy of a Disaster • Disaster Prevention
0830 - 0930	<b>Safety Integrity Level (SIL)</b> Introduction • Definition • Selection Procedure • Practical Examples
0930 - 0945	Break
0945 - 1100	<b>Loop Safety Considerations</b> Intrinsic Safety • Explosion-Proof • Approval Standards • Oxygen Service
1100 - 1230	<b>Flow Calibration</b> General • Trends in Calibration • Types of Calibration Test Rigs • In-Situ Calibration • Turbine Meters





1230 - 1245	Break
1245 - 1420	<b>Meter Proving</b> Practical Exercise
1420 - 1430	<b>Recap</b> 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: Thursday, 12<sup>th</sup> of December 2024**

0730 - 0800	<b>Field Communications</b> Analogue Signals • Digital Communications • Fieldbus Technologies • Future Trends
0800 - 0830	<b>Maintain Field Instruments</b>
0830 - 0900	<b>Video Presentation</b> HART Protocol
0900 - 0930	<b>Testing &amp; Commissioning Field Instruments</b>
0930 - 0945	Break
0945 - 1100	<b>Case Studies</b> Bhopal Gas Tragedy • Piper Alpha Disaster • Chernobyl Catastrophe • Buncefield Oil Depot Explosion
1100 - 1230	<b>Video Presentation</b> BP Texas City - Refinery Explosion
1230 - 1245	Break
1245 - 1345	<b>Addendums</b> Review of Course • Valve Sizing Exercise • Choke Valves • Any Other Subjects
1345 - 1400	<b>Review Session &amp; Course Conclusion</b> Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course
1400 - 1415	<b>POST-TEST</b>
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”, “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**



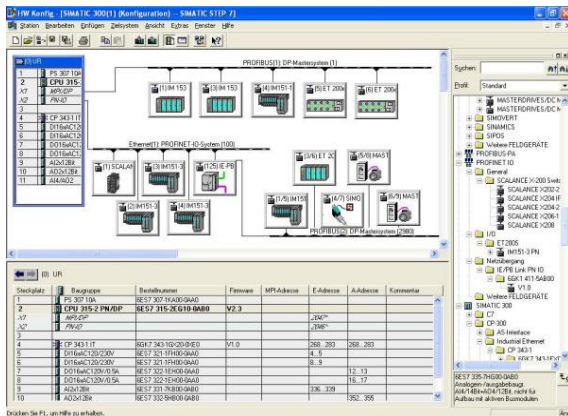
**Siemens SIMATIC S7-300**



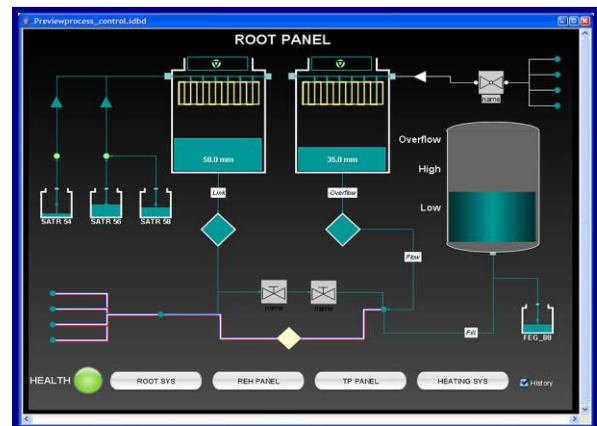
**Siemens S7-200 Simulator**



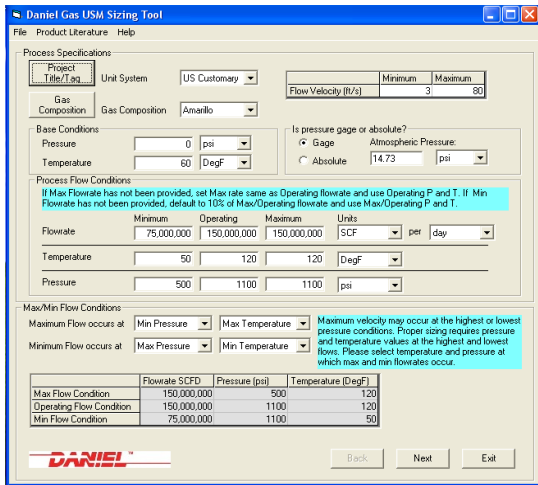
**GE Fanuc Series 90-30 PLC Simulator**



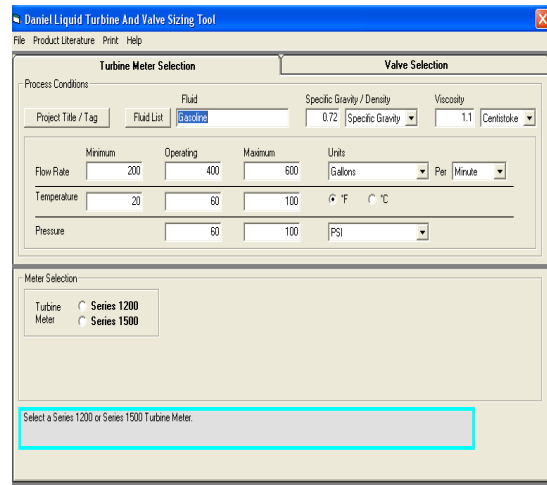
**Siemens SIMATIC Step 7 Professional Software**



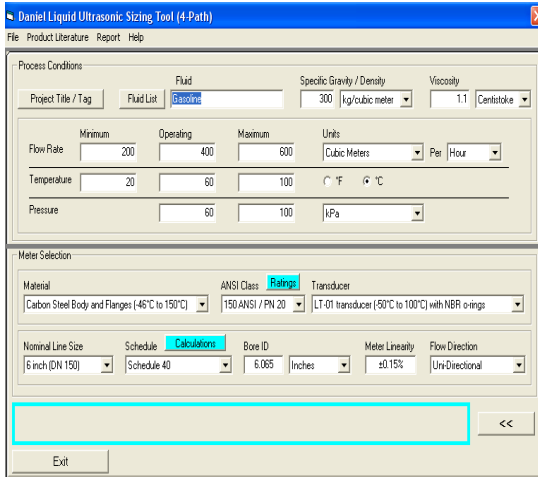
**HMI SCADA**



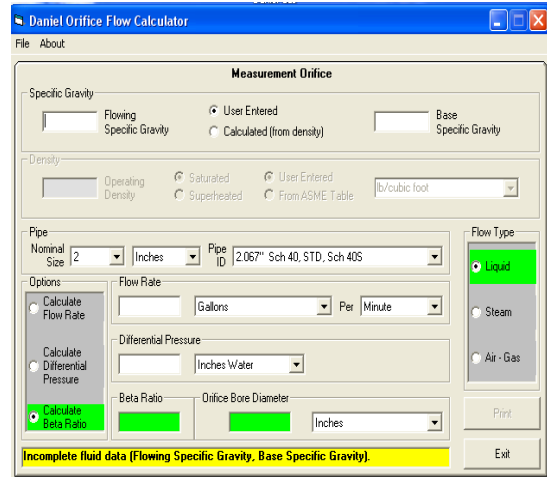
**Gas Ultrasonic Meter (USM) Sizing Tool Simulator**



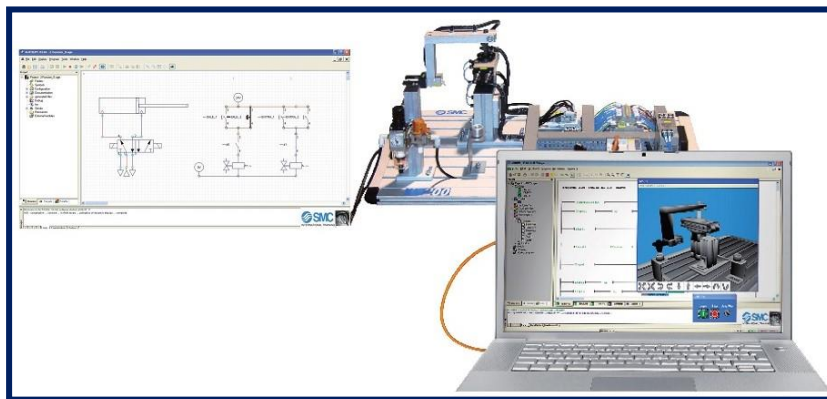
**Liquid Turbine Meter and Control Valve Sizing Tool Simulator**



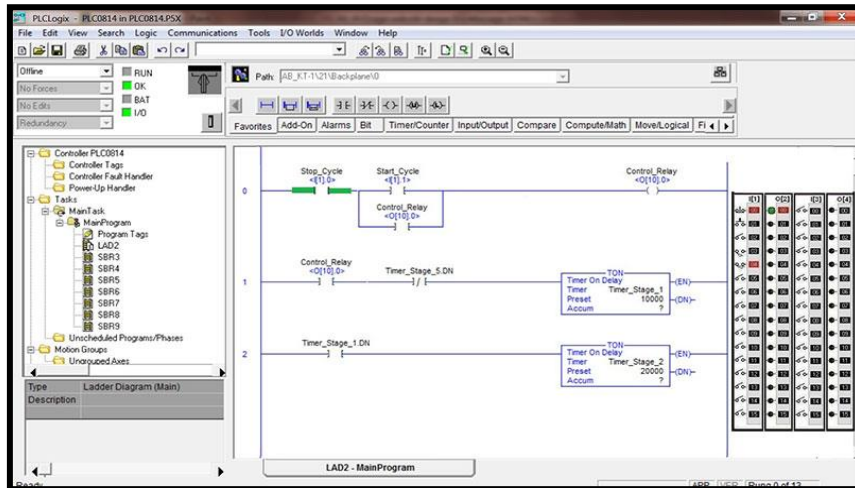
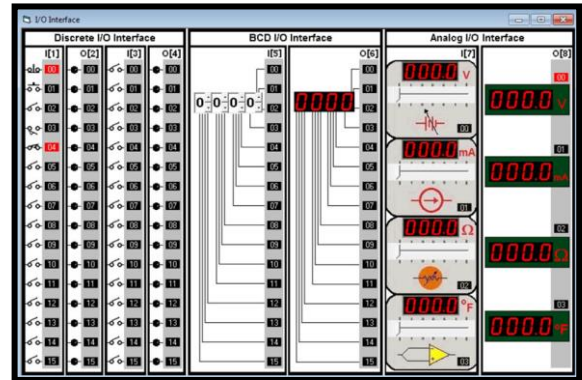
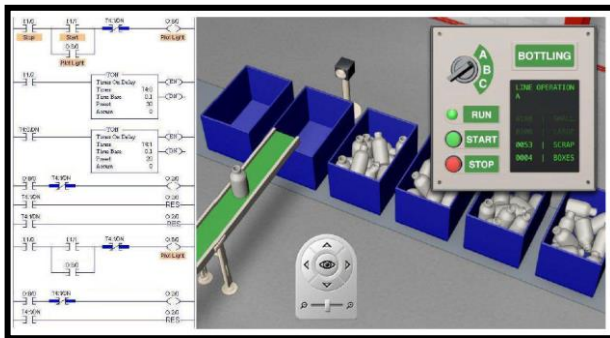
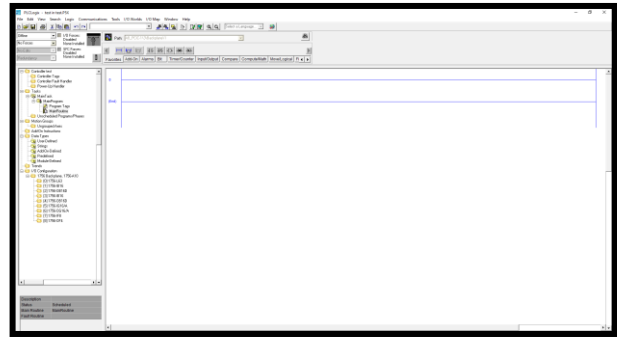
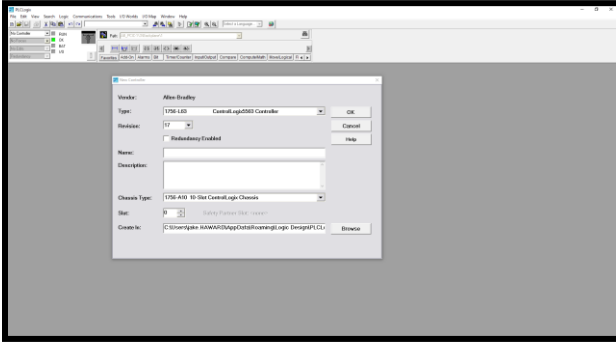
**Liquid Ultrasonic Meter Sizing Tool Simulator**



**Orifice Flow Calculator Simulator**



**AutoSIM – 200 Automation Simulator**



**PLCLogix 5000 Software**

**Course Coordinator**

Reem Dergham, Tel: +974 4423 1327, Email: [reem@haward.org](mailto:reem@haward.org)