

**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	May 26-30, 2024	Oryx Meeting Room, Doubletree By Hilton Doha-Al Sadd, Doha, Qatar
2	September 23-27, 2024	Hampstead Meeting Room, London Marriott Hotel Regents Park, London, United Kingdom
3	November 24-28, 2024	Kizkulesi, Crown Plaza Istanbul Asia Hotels & Convention Center, Istanbul, Turkey
4	January 26-30, 2025	The Kooch Al Noor Meeting Room, The H Dubai Hotel, Sheikh Zayed Rd - Trade Centre, Dubai, UAE

**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.

**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 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, Instrumentation Engineering, Process Control (PCI) & Safeguarding, Instrument Calibration & Maintenance, Instrumented Safety Systems, High Integrity Protection Systems (HIPS), Process Controller, Control Loop & Valve Tuning, 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 Adroit, 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, 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



### Course Fee

Doha	<b>US\$ 6,000</b> per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
London	<b>US\$ 8,800</b> per Delegate + <b>VAT</b> . This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Istanbul	<b>US\$ 6,000</b> per Delegate + <b>VAT</b> . This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Dubai	<b>US\$ 5,500</b> per Delegate + <b>VAT</b> . 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 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	<i>Registration &amp; Coffee</i>
0800 - 0815	<i>Welcome &amp; Introduction</i>
0815 - 0830	<b>PRE-TEST</b>
0830 - 0900	<b>Introduction</b> <i>Course Content • Objectives of Course</i>
0900 - 0930	<b>Introduction to Process Control</b> <i>Control History • The Process of Control • Basic Measurement Definitions • P&amp;ID Symbols • Control Loops • Typical Applications</i>
0930 - 0945	<i>Break</i>
0945 - 1100	<b>Pressure Measurement</b> <i>Basic Principles • Definition of Terminology • Pressure Elements • Pressure Transducers • Installation Considerations • Summary</i>
1100 - 1230	<b>Temperature Measurement</b> <i>Principles • Thermocouples • RTD's • Thermistors Thermometer • Infra-Red Thermometry • Installation Considerations</i>
1230 - 1245	<i>Break</i>
1230 - 1330	<b>Level Measurement</b> <i>Main Types • Sight Glass Method • Buoyancy Tape Systems • Hydrostatic Pressure • Ultrasonic Measurement • Radar Measurement • Electrical Measurement • Installation Considerations</i>
1330 - 1420	<b>Video Presentation</b> <i>Radar Level Measurement</i>
1420 - 1430	<b>Recap</b>
1430	<i>Lunch &amp; End of Day One</i>



**Day 2**

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>
1430	Lunch & End of Day Two

**Day 3**

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>
1430	Lunch & End of Day Three





**Day 4**

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>
1430	Lunch & End of Day Four

**Day 5**

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>
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**



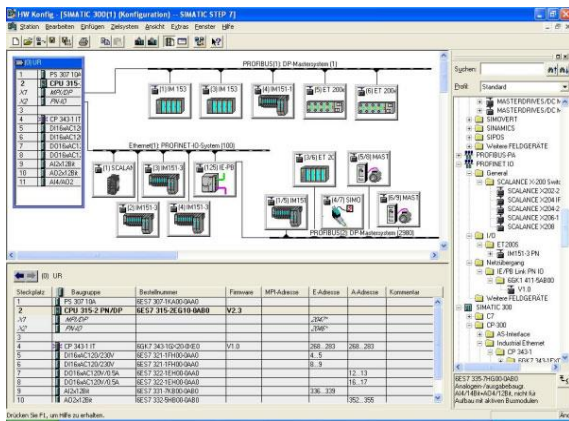
**Siemens SIMATIC S7-300**



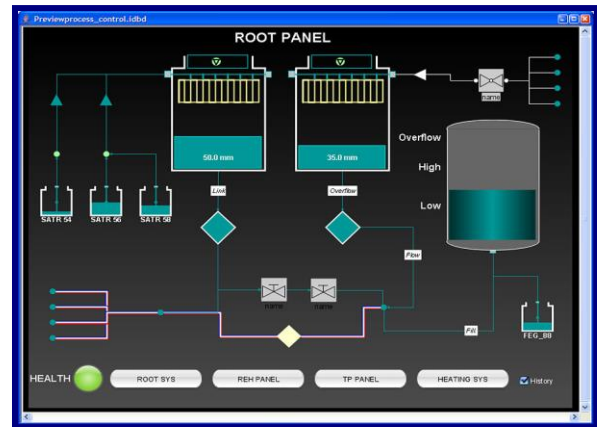
**Siemens S7-200 Simulator**



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

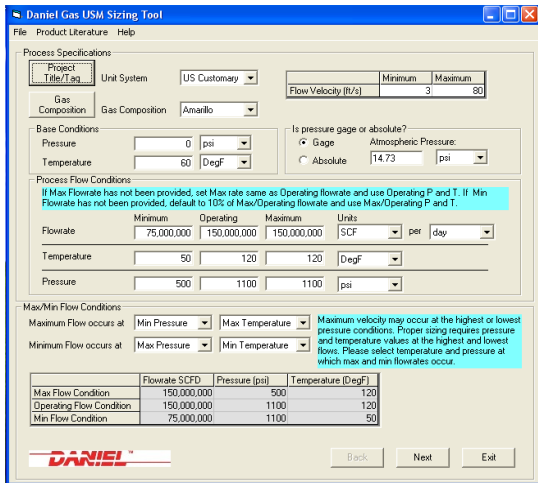


**Siemens SIMATIC Step 7 Professional Software**

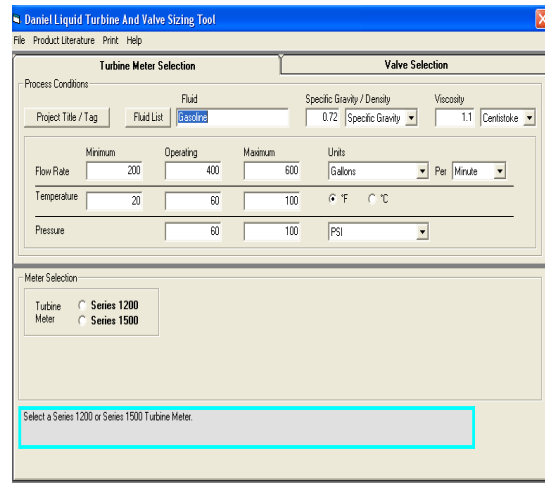


**HMI SCADA**

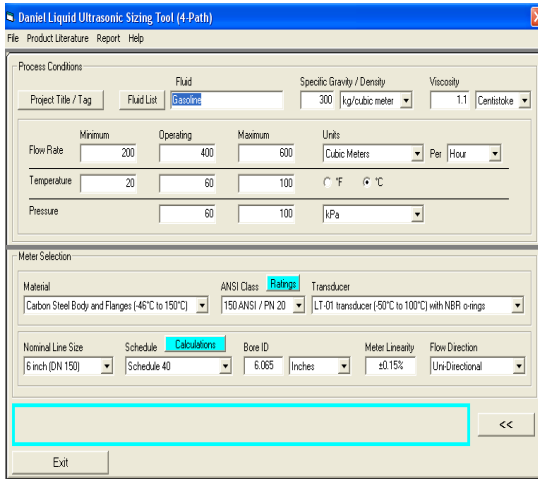




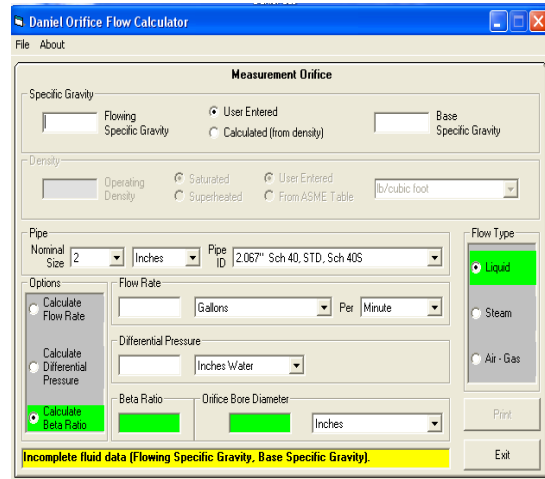
**Gas Ultrasonic Meter (USM) Sizing Tool Simulator**



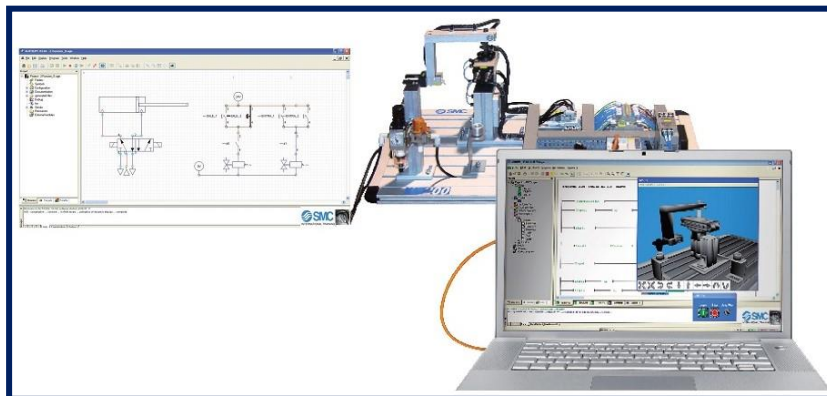
**Liquid Turbine Meter and Control Valve Sizing Tool Simulator**



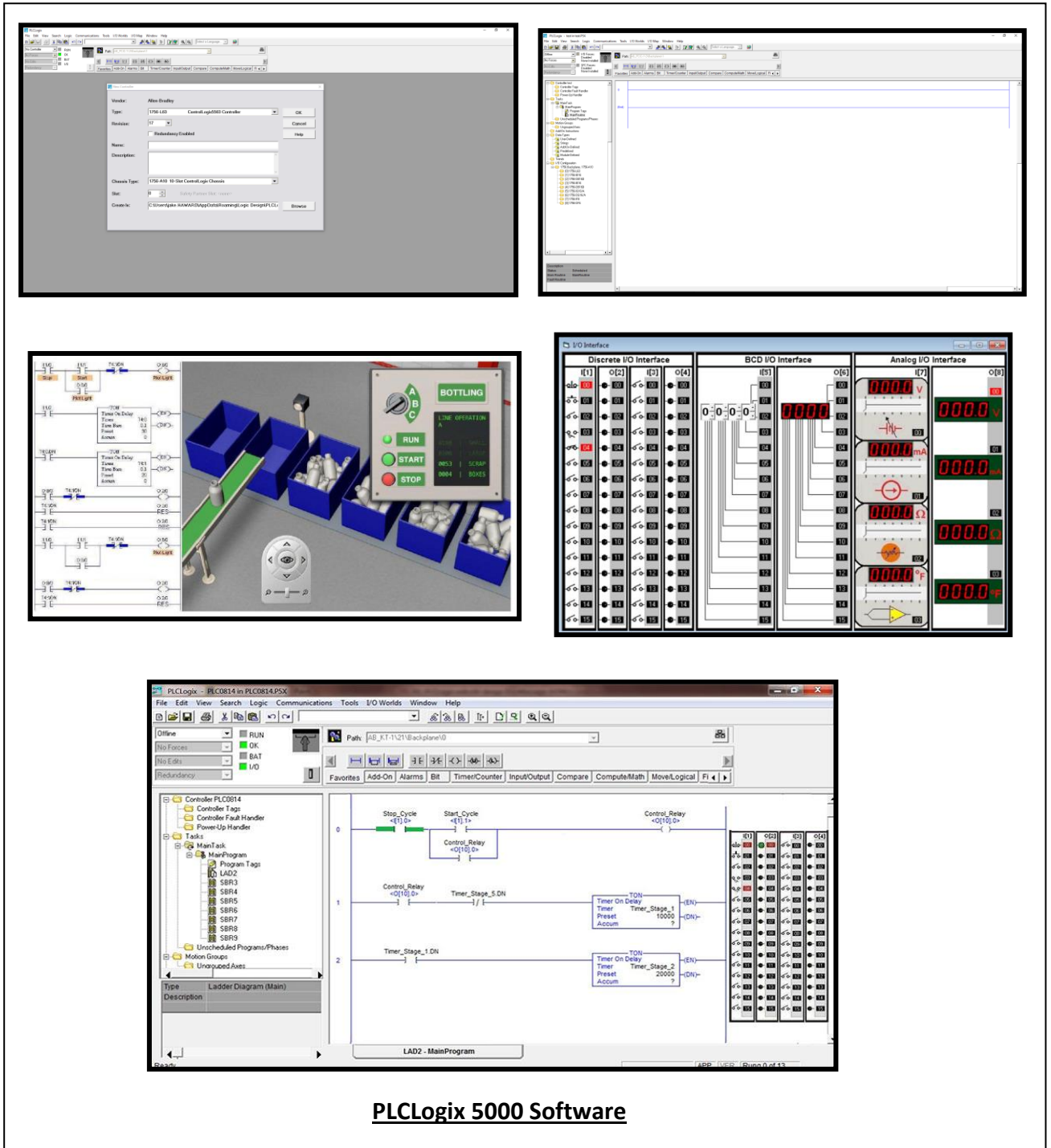
**Liquid Ultrasonic Meter Sizing Tool Simulator**



**Orifice Flow Calculator Simulator**



**AutoSIM – 200 Automation Simulator**



The image displays several screenshots of the PLCLogix 5000 software interface. The top-left screenshot shows a dialog box for adding a device, with fields for Name, Description, and Check Type. The top-right screenshot shows a project tree with various components like PLC, I/O, and Motion. The middle-left screenshot shows a 3D simulation of a bottling line with a control panel featuring buttons for RUN, START, and STOP, and a digital display showing 'BOTTLING' and 'LINE OPERATION'. The middle-right screenshot shows three I/O interface panels: Discrete I/O Interface, BCD I/O Interface, and Analog I/O Interface, each with multiple channels and status indicators. The bottom screenshot shows the main ladder logic diagram for the 'MainProgram', featuring a 'Control\_Relay' and two 'Timer On Delay' blocks (Timer\_Stage\_1 and Timer\_Stage\_2).

**PLCLogix 5000 Software**

**Course Coordinator**

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