COURSE OVERVIEW IE0098
Advancement in RTU Communication & Automation Systems

Course Title
Advancement in RTU Communication & Automation Systems

Course Date/Venue
Session 1: April 07-11, 2025/Ajman Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: October 19-23, 2025/Ajman Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
IE0098

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 our state-of-the-art simulators.

This course is designed to provide delegates with a detailed and up-to-date overview of Advancement in RTU Communication & Automation Systems. It covers the purpose of RTUs, the key differences of RTU and PLC and the common industries using RTUs; the RTU hardware architecture, RTU communication protocol and advances in communication media; the common vulnerabilities in RTU system; the importance of data encryption, authentication and access control and cybersecurity standards; the modbus RTU & TCP/IP, DNP3 protocol and IEC protocols in RTUs; and the basics of MQTT protocol, publishing/subscribing model in RTU system and integrating MQTT with industrial IoT platforms.

Further, the course will also discuss the role of protocol converters and gateway configurations; the SCADA system integration and PLC and RTU interfacing; the remote monitoring and control covering real-time data acquisition, web-based RTU monitoring, cloud integration with RTUs and fault detection and diagnostics; the edge computing concepts and the benefits of edge analytics; the redundancy and reliability in RTU systems; the role of RTUs in data collection and basic principles of predictive maintenance; and integrating RTU data with analytics platforms and dashboard and reporting tools.

During the interactive course, participants will learn the artificial intelligence in automation systems, RTUs in smart grids and wireless sensor networks (WSN); reducing the RTU energy consumption, optimizing communication processes and design eco-friendly RTUs; the project management in RTU system deployment covering RTU system implementation, budgeting and resource allocation, risk management in RTU project and evaluating project success; the future trends in RTU communication comprising of advancements in IIoT for RTUs, integration of blockchain in RTU system, role of quantum communication in automation and predictions for RTU evolution; the preventive maintenance best practices, diagnosing communication failures, updating RTU firmware and software and remote troubleshooting techniques; and the system requirements, selecting hardware and protocols, design scalability and redundancy and building a cybersecurity strategy.

Course Objectives

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

- Apply and gain a comprehensive knowledge on the advancement in RTU communication and automation systems
- Discuss the purpose of RTUs, the key differences of RTU and PLC and the common industries using RTUs
- Explain the RTU hardware architecture, RTU communication protocol and advances in communication media
- Identify the common vulnerabilities in RTU systems, importance of data encryption, authentication and access control and cybersecurity standards
- Recognize modbus RTU & TCP/IP, DNP3 protocol and IEC protocols in RTUs
- Discuss the basics of MQTT protocol, publish/subscribe model in RTU systems and integrate MQTT with industrial IoT platforms
- Define the role of protocol converters and apply gateway configurations, SCADA system integration and PLC and RTU interfacing
- Employ remote monitoring and control covering real-time data acquisition, web-based RTU monitoring, cloud integration with RTUs and fault detection and diagnostics
- Describe edge computing concepts and the benefits of edge analytics as well as redundancy and reliability in RTU systems
- Discuss the role of RTUs in data collection, basic principles of predictive maintenance, integrating RTU data with analytics platforms and dashboard and reporting tools
- Recognize artificial intelligence in automation systems, RTUs in smart grids and wireless sensor networks (WSN)
- Reduce RTU energy consumption, optimize communication processes and design eco-friendly RTUs
- Apply project management in RTU system deployment covering RTU system implementation, budgeting and resource allocation, risk management in RTU project and evaluating project success

- Discuss the future trends in RTU communication comprising of advancements in IIoT for RTUs, integration of blockchain in RTU system, role of quantum communication in automation and predictions for RTU evolution
- Employ preventive maintenance best practices, diagnosing communication failures, updating RTU firmware and software and remote troubleshooting techniques
- Identify system requirements, select hardware and protocols, design scalability and redundancy and build a cybersecurity strategy

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 advancement in RTU communication and automation systems for automation engineers, control systems engineers, electrical engineers, instrumentation engineers, SCADA system operators/engineers, telecommunication engineers, project managers, technical support and maintenance staff, system integrators and other technical staff.

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 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.

Accommodation

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

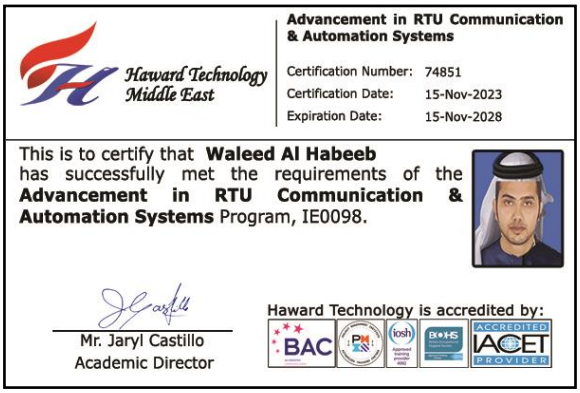
Course Certificate(s)

(1) Internationally recognized Competency Certificates and Plastic Wallet Cards will be issued to participants who completed a minimum of 80% of the total tuition hours and successfully passed the exam at the end of the course. Certificates are valid for 5 years.

Recertification is FOC for a Lifetime.

Sample of Certificates

The following are samples of the certificates that will be awarded to course participants: -



(2) Official Transcript of Records will be provided to the successful delegates with the equivalent number of ANSI/IACET accredited Continuing Education Units (CEUs) earned during the course.

* Haward Technology * CEUs * Haward Technology * CEUs * Haward Technology * CEUs * Haward Technology *

Haward Technology Middle East

Continuing Professional Development (HTME-CPD)

CEU Official Transcript of Records

TOR Issuance Date: 15-Nov-23

HTME No. 74851

Participant Name: Waleed Al Habeeb

Program Ref.	Program Title	Program Date	No. of Contact Hours	CEU's
IE0098	Advancement in RTU Communication & Automation Systems	November 11-15, 2023	30	3.0

Total No. of CEU's Earned as of TOR Issuance Date **3.0**

TRUE COPY

Jaryl Castillo
Academic Director

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

P.O. Box 26070, Abu Dhabi, United Arab Emirates | Tel.: +971 2 3091 714 | E-mail: info@haward.org | Website: www.haward.org

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.

- 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.

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. John Vorster, MSc, BTech, is a **Senior Instrumentation, Control & Energy Engineer** with over **25 years** of industrial experience within the **Oil**, **Gas**, **Process**, **Refinery**, **Power** and **Nuclear** industries. His wide expertise includes Programmable Logic Controller (**PLC**), **Process Control** Design & Plant Modelling, **Instrumentation**, **Automation**, **Process Control** Instrumentation, **Process Control**, **SCADA** System, Introduction to **SCADA**, **PLC & SCADA** for Automation & Process Control, Distributed Control System (**DCS**), **Instrumentation & Safeguarding**, **Process Control Measurement**, **Pressure** Measurements, **Temperature** Measurements, **Level** Measurement, **Flow** Measurement, **Control Valves & Actuators**, **Energy Management** System Awareness, **Renewable Energy**, **Energy** Conservation & Technologies, **Utility Systems**, **Nuclear** Energy, **Distributed Energy Systems**, **Natural Gas Distribution**, **Field Indication Instruments**, **P&ID** & Technical Specification, **Test Equipment Calibration**, **Field Bus** & **Field Communications**, Testing, Calibration & Maintenance of **Flow**, **Level**, **Pressure & Temperature**, **Loss Control** & **Multiphase Flowmetering**, **Custody Measurement** & **Loss Control**, **Flow Measurement** & **Custody Measurement**, **Flow Computer**, **Turbine Flowmeters**, **Ultrasonic Flowmeter**, **Positive Displacement Flowmeter**, **Coriolis Flowmeter**, **Flow Rate Corrections**, **Pressure Flow Transmitters**, **Pressure Methods**, **Flow Nozzles**, **Orifice Plates**, **Venturi Tubes**, **Pitot Tubes**, **Analyzer** Measurement Systems, **Pressure** Management, Selection & Sizing of all Instrumentation, **SIL** Criteria, Calibration & Configuration of Installed Instrumentation, **Bearing Replacement** and **Control Valves**. Further, he is also well-versed in HAZOP, LOPA Studies, Radiation Protection, Hazardous Substances, Hazardous Area Classification, Nuclear Devices Maintenance, Loop Drawings, Loop Calculations, Engineering Drawings, Shutdown Maintenance & Planning, Asset Management, Six Sigma, Energy Management & Measurements, Project Management, Strategic Resource Planning, Budget Preparation, ISO 9001, ISO 14000 and ISO 18000 standards. He is currently the **Instrumentation Analyzer & Engineer** of **Sasolburg** wherein he is in-charge of the design and monitoring of the analyzer measurement systems.

During his career life, Mr. Vorster has gained his practical and field experience through his various significant positions and dedication as the **Project Manager**, **Senior Trainer/Instructor**, **Senior Instrumentation Engineer**, **Instrumentation Engineer**, **Green Belt Project Leader**, **Instrumentation Technologist**, **Senior Instrumentation/Electrical Artisan**, **Instrumentation Artisan** and **Apprentice Instrumentation** for numerous international companies including **Sasolburg**, **DOW Chemical Company**, **Safripol** and **Iscor**.

Mr. Vorster has a **Master's** degree in **Engineering Development & Management**, as well as a **Bachelor's of Technology** degree and a **National Diploma** in **Electrical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), an **Appointed Radiation Protection Officer** and a **Qualified Instrument Mechanician**. Moreover, he is an active member of Project Management Institution (**PMI**) and South African Institute of Measure and Control (**SAIMC**) and has delivered numerous courses, workshops, conferences and seminars internationally.

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 to RTU Systems*** *Definition & Purpose of RTUs • Historical Evolution of RTU Systems • RTU versus PLC: Key Differences • Common Industries Using RTUs*
0900 – 0930	***RTU Hardware Architecture*** *RTU Processor Units • I/O Modules & Configurations • Power Supply Systems • Environmental Considerations (Temperature, Humidity, etc.)*
0930 – 0945	*Break*
0945 – 1100	***RTU Communication Protocols Overview*** *Serial Communication (RS-232, RS-485) • Modbus Protocol Basics • DNP3 Protocol Fundamentals • Introduction to IEC 60870-5*
1100 – 1230	***Advances in Communication Media*** *Fiber-Optic Communication • Wireless Communication in RTUs • Satellite Communication for Remote RTUs • Cellular Technologies (4G/5G)*
1230 – 1245	*Break*
1245 – 1330	***Cybersecurity in RTU Communication*** *Common Vulnerabilities in RTU Systems • Importance of Data Encryption • Authentication & Access Control • Cybersecurity Standards (e.g., NERC CIP, IEC 62351)*
1300 – 1420	***Hands-on Activity: Basic RTU Configuration*** *Setting up an RTU System • Connecting Basic I/O Devices • Monitoring Real-Time Data using Modbus*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Modbus*** *Modbus RTU versus Modbus TCP/IP • Addressing & Function Codes • Modbus Mapping • Troubleshooting Common Modbus Issues*
0830 – 0930	***Understanding DNP3 Protocol*** *Role of DNP3 in SCADA System • Event-Driven versus Polling Mechanisms • DNP3 Object Groups & Variations • Secure Authentication in DNP3*
0930 – 0945	*Break*
0945– 1100	***IEC Protocols in RTUs*** *Introduction to IEC 61850 • Key Features & GOOSE Messaging • Comparison with IEC 60870-5 • Practical Applications in Substations*
1100 – 1230	***MQTT & IIoT Integration*** *Basics of MQTT protocol • Publish/Subscribe Model in RTU Systems • Integration with Industrial IoT Platforms • Security Considerations in MQTT*
1230 – 1245	*Break*

1245 – 1300	***Protocol Conversion & Gateways*** *Role of Protocol Converters • Gateway Configurations • Challenges in Protocol Conversion • Case studies: Multi-Protocol RTU Systems*
1300 – 1420	***Hands-on Activity: Protocol Analysis*** *Simulating Modbus & DNP3 communication • Capturing Data Packets using Wireshark • Analyzing Protocol Performance*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0900	***SCADA System Integration*** *RTU as a Data Source for SCADA • RTU-SCADA Communication Workflows • Alarm & Event Management • Data Visualization Best Practices*
0900 – 0930	***PLC & RTU Interfacing*** *RTU-PLC Communication Methods • Protocol Compatibility • Case Study: Hybrid Automation Systems • Challenges in RTU-PLC Integration*
0930 – 0945	*Break*
0945 – 1100	***Remote Monitoring & Control*** *Real-Time Data Acquisition • Web-based RTU Monitoring • Cloud Integration with RTUs • Fault Detection & Diagnostics*
1100 – 1230	***Edge Computing in RTUs*** *Overview of Edge Computing Concepts • Benefits of Edge Analytics • Real-Time Decision-Making at the RTU Level • Use Cases for Edge RTUs*
1230 – 1245	*Break*
1245 – 1330	***Redundancy & Reliability in RTU Systems*** *Dual Communication Paths • Hot Standby Configurations • Fault-Tolerant Designs • Testing & Maintenance Strategies*
1330 – 1420	***Hands-on Activity: SCADA-RTU Integration*** *Configuring RTUs for SCADA Systems • Implementing Alarms & Notifications • Simulating System Failures & Recovery*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Data Analytics & RTU Systems*** *Role of RTUs in Data Collection • Basic Principles of Predictive Maintenance • Integrating RTU Data with Analytics Platforms • Dashboards & Reporting Tools*
0830 - 0930	***Artificial Intelligence in Automation Systems*** *AI Applications in RTU-Based Automation • Machine Learning for Fault Prediction • Neural Networks for Process Optimization • Case Studies: AI-Driven RTU Systems*
0930 – 0945	*Break*
0945 – 1030	***RTUs in Smart Grids*** *Role of RTUs in Smart Grid Automation • Load Balancing & Demand Response • Integration with Renewable Energy Sources • Standards & Regulations for Smart Grids*
1030 – 1130	***Wireless Sensor Networks (WSN) & RTUs*** *Basics of WSN for Industrial Automation • RTU-WSN Integration Workflows • Power Management in Wireless Sensors • Emerging Technologies in WSN*

1130 – 1230	***Energy Efficiency in RTU Systems*** *Reducing RTU Energy Consumption • Optimizing Communication Processes • Energy Harvesting Technologies • Designing Eco-Friendly RTUs*
1230 – 1245	*Break*
1245 – 1420	***Hands-on Activity: Advanced Configuration*** *Configuring AI Tools with RTU Data • Implementing a Smart Grid Use Case • Deploying WSN with RTUs*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Project Management in RTU System Deployment*** *Steps in RTU System Implementation • Budgeting & Resource Allocation • Risk Management in RTU Projects • Evaluating Project Success*
0830 - 0930	***Future Trends in RTU Communication*** *Advancements in IIoT for RTUs • Integration of Blockchain in RTU Systems • Role of Quantum Communication in Automation • Predictions for RTU Evolution*
0930 – 0945	*Break*
0945 – 1030	***RTU Maintenance & Troubleshooting*** *Preventive Maintenance Best Practices • Diagnosing Communication Failures • Updating RTU Firmware & Software • Remote Troubleshooting Techniques*
1030 - 1230	***Case Studies & Real-world Applications*** *RTUs in Oil & Gas • RTUs in Water & Wastewater Management • RTUs in Transportation Systems • Lessons Learned from Industry Failures*
1230 – 1245	*Break*
1245 - 1300	***Designing a Robust RTU System*** *Identifying System Requirements • Selecting Hardware & Protocols • Designing for Scalability & Redundancy • Building a Cybersecurity Strategy*
1300 - 1315	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1315 – 1415	***COMPETENCY EXAM***
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

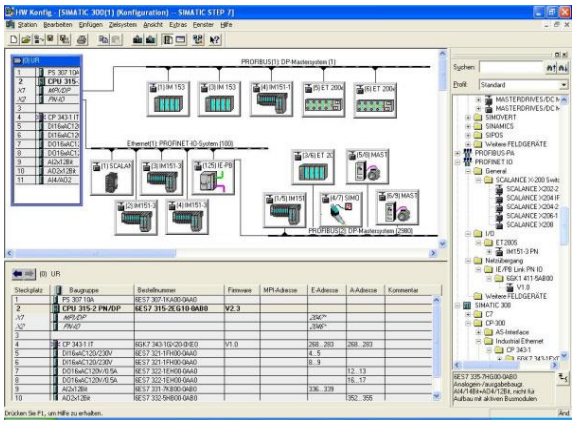
Siemens S7-1200 Simulator

Siemens S7-400 Simulator

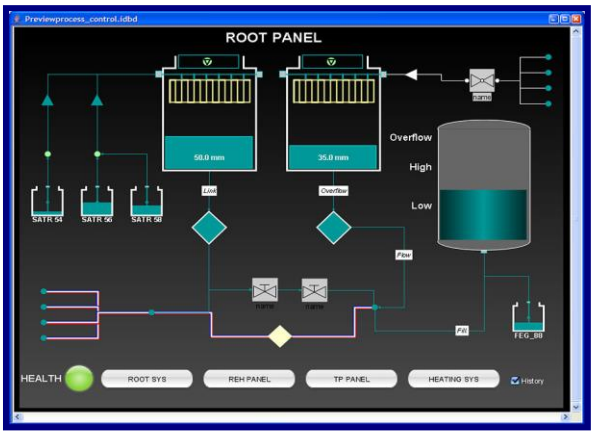
Siemens SIMATIC S7-300

Siemens S7-200 Simulator

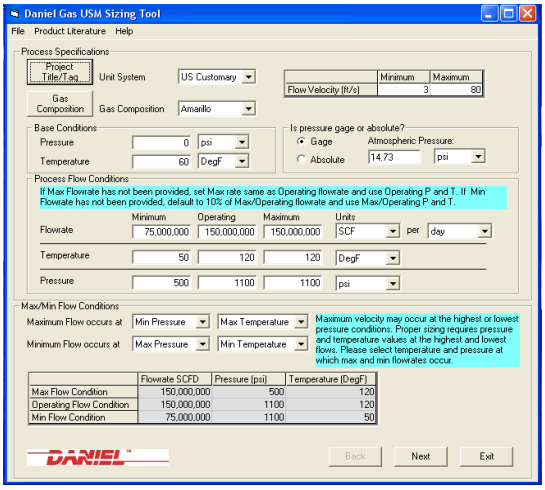
GE Fanuc Series 90-30 PLC Simulator



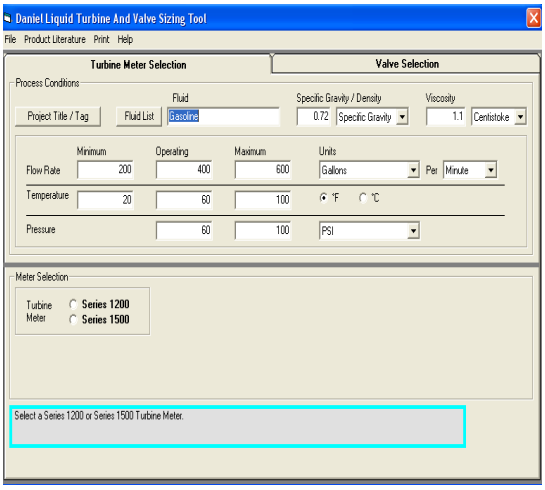
Siemens SIMATIC Step 7 Professional Software



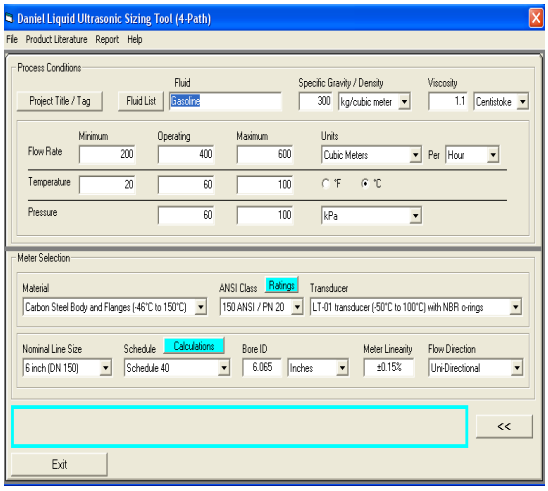
HMI SCADA



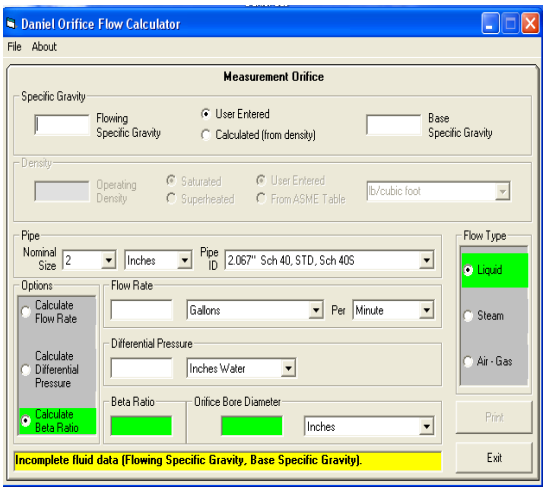
Gas Ultrasonic Meter (USM) Sizing Tool Simulator



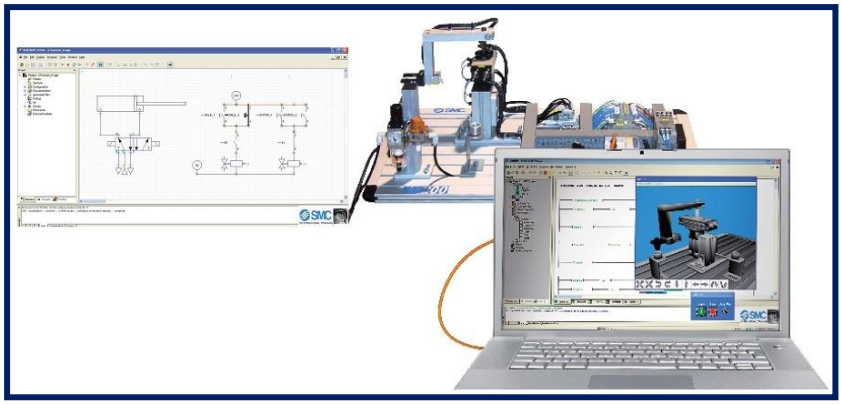
Liquid Turbine Meter and Control Valve Sizing Tool Simulator



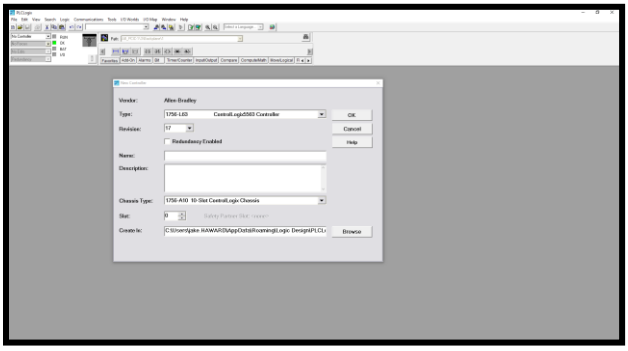
Liquid Ultrasonic Meter Sizing Tool Simulator

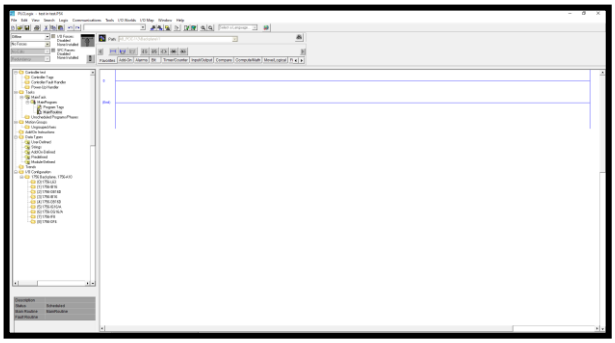


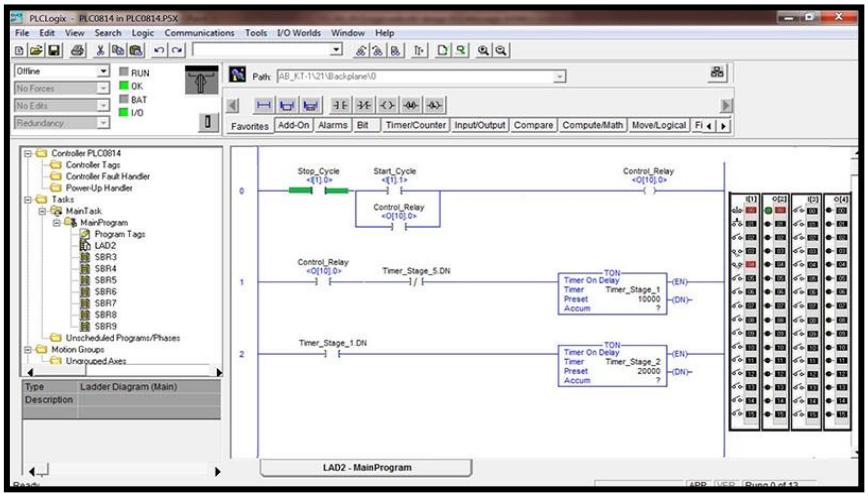
Orifice Flow Calculator Simulator



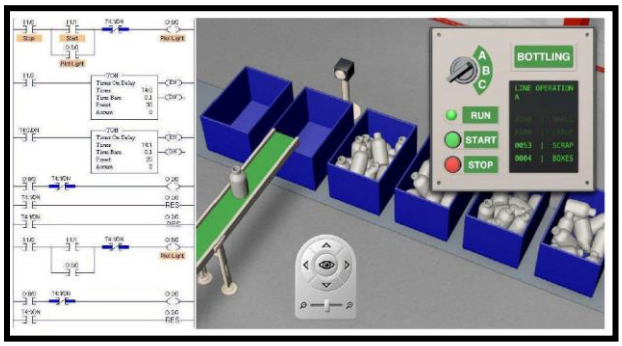
AutoSIM – 200 Automation Simulator

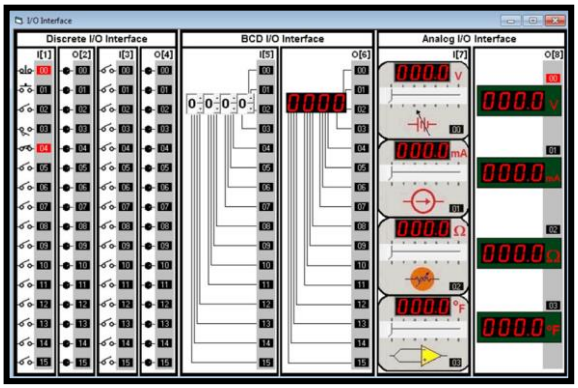






PLCLogix 5000 Software





Course Coordinator
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