COURSE OVERVIEW IE0680
Process Control, Instrumentation & Safeguarding

Course Title
Process Control, Instrumentation & Safeguarding

Course Date/Venue
March 03-07, 2024/Oryx Meeting Room, Doubletree By Hilton Doha-Al Sadd, Doha, Qatar

Course Reference
IE0680

3.0 CEUs (30 PDHs) AWARD

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.

Control systems for industrial applications 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 safety and reliability.

The ANSI SP 84 (formerly ISA 84.01) “Application of Safety Instrumented Systems for the Process Industries” standard requires that companies assign a target safety integrity level (SIL) for all safety instrumented systems (SIS) applications. The assignment of the target SIL is a decision requiring the extension of the process hazards analysis (PHA). The assignment is based on the amount of risk reduction that is necessary to mitigate the risk associated with the process to an acceptable level. All of the SIS design, operation, and maintenance choices must then be verified against the target SIL.

This course provides participants with the perfect bridge between theories and practical knowledge gained on the plant floor. It provides a thorough exposition of control components, pneumatics, actuators, and regulators and details their application to the industrial process. The course is designed for engineers and technicians in order to update them with the latest technologies in process automation, control and safeguarding. It covers the systematic method for selecting safety integrity levels (SIL's) for safety instrumented systems (SIS).

Some of the material in this course is based on the application of the safety life cycle as it is described in the international standards ANSI SP 84 "Application of Safety Instrumented Systems for the Process Industries" and EN/IEC 61508/61511. This course expands upon the framework developed in these standards. In addition to describing the tasks that users should perform during the safety life cycle, this course also provides detailed procedures for accomplishing these tasks. These procedures are based on risk analysis and reliability engineering principles from a variety of disciplines. Each topic will be discussed in a logically organized manner and contains an abundance of realistic problems, examples, and illustrations to challenge the participants to think and encourage them to apply this knowledge to the solution of practical problems.

Course Objectives

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

- Apply and gain an in-depth knowledge and skills in process control, instrumentation and safeguarding
- Practice pressure measurement, level measurement, temperature measurement & flow measurement and recognize their importance in process control
- Identify the various types of Control Valves and learn how to choose the right valve using the selection guidelines and application comparison
- List the various types of actuators and be able to demonstrate valve selection & sizing
- Illustrate field communications including their classifications and safety considerations
- Apply the basic control concepts, including variables, elements, system responses and on-off control and implement modes of control
- Discuss the principles, types, features, configurations and functions of distributed control systems (DCS), programmable logic controllers (PLC) and SCADA systems and recognize their practical applications in process control
- Apply the safety engineering principles and standards and learn the concept of safety life cycle as well as its various models and phases
- Practice hazard analysis as applied in process control safeguarding and employ the safety instrumented functions (SIF), SIS and SIL techniques
- Employ the alarm management concepts, principles, architecture, displays, functions and operator considerations
- Recognize the future trends in measurement, control system & communication technology

Who Should Attend

This course provides an overview of all significant aspects and considerations of process control, instrumentation and safeguarding for process control engineers and supervisors, instrumentation and control system engineers, automation engineers, application engineers and technologists, process engineers, electrical engineers and supervisors and those involved in the design, implementation, upgrading and safeguarding of industrial control systems.

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.

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:

Dr. Alaa Abdel Kerim, PhD, MSc, BSc, is a **Senior Electrical**, **Instrumentation & Control Engineer** with **45 years** of extensive experience in the **Power**, **Petrochemical**, **Refinery**, **Oil** and **Gas** industries. He specializes in **Plant Control** System, **Instrumented Control** System, **Process Control & Instrumentation**, **DCS**, **PLC**, **SCADA** Systems, **HMI**, Programmable Logic Controller (**PLC**) Operations, Maintenance & Troubleshooting (**Siemens Simatic S7-300/400**), **Allen Bradley**, Modern **PLC/SCADA** for **ATS**, **Generator Parallel** Operation, **Electricity Distribution Networks**, **Electrical Transmission & Tie Lines**, **HMI Wire**, **Wireless & Communication Network**, Modern **Instrumentations/Automatic Control Principals** for Water & Wastewater Lifting Plants and Water & Wastewater Treatment Plants, **Substation Automation** Systems & Its Applications, **Siemens SIMATIC S7** Maintenance & Configuration, Modern **Automation Control** Systems, **Hydrocarbon**, **Measurement** Instrumentation, **Pressure** Measurement, **Level & Flow** Measurement, **Temperature & Vibration** Measurement, **Analytical Instrumentation**, **Calibration & Testing** Safety Procedures, **Find Control Elements**, **Control Loop** Operation, **Industrial System** Equipment & Building Installation, **Artificial Intelligence** (**AI**), **Data Acquisition & Transmission**, **Electronics Technology**, **Power Systems** Control, **Modern Electric Power** Systems, **Power Systems Security**, **Series Reactors** in **Power System**, **Power Transmissions**, **Power Generation**, **Electrical Troubleshooting** Techniques, **Electrical Substations** and **MV/LV Electrical** System.

During his career life, Dr. Alaa has been practically and academically involved in different **Power System** and **Instrumentation & Control** international companies and universities as the **Senior Professor & Consultant**, **Lecturer/Trainer**, **Instrumentation & Control Engineer/Trainer** and **Electrical Engineer/Trainer**. His recent practical applications experience includes the design, supply, installation, operation of full **DCS**, **SCADA**, **PLC**, **HMI Automation System** for **Sumid Line Petroleum**, **Siemens USA**, **AREVA USA** to name a few. His experience also includes electrical coordination, protection level adjustments and electrical testing.

Dr. Alaa has a **PhD** degree in **Electrical Engineering** from the **Technical University of Gdansk**, **Poland** and has **Master** and **Bachelor** degrees in **Electrical Machine & Power Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**) and has further delivered numerous trainings and workshops worldwide.

Course Fee

Doha	**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.

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	***Review of Course*** *Objectives of Course ● Timetables*
0900 – 0930	***Introduction to Process Control*** *Basic Concepts ● Performance Terms ● Process Control Fundamentals*
0930 – 0945	*Break*
0945 – 1030	***Pressure Measurement*** *Bourdon Spring ● Spring & Bellows Element ● Diaphragm Elements ● Pressure Transducers ● Installation Considerations*
1030 – 1100	***Level Measurement*** *Main Types ● Buoyancy Tape Systems ● Hydrostatic Pressure ● Ultrasonic Measurement ● Radar Measurement ● Electrical Measurement ● Installation Considerations*
1100 – 1145	***Video Presentation*** *Radar Level Measurement*
1145 – 1230	***Temperature Measurement*** *Thermocouples ● RTD's ● Installation Considerations*
1230 – 1245	*Break*
1245 – 1330	***Flow Measurement*** *Differential Pressure Flowmeters ● Oscillatory Flow Measurement ● Non-Intrusive Flowmeters ● Mass Flow Meters ● Positive Displacement Meters ● Installation Considerations ● Selection Guidelines*
1330 – 1420	***Video Presentations*** *Coriolis Mass Flow Measurement ● Ultrasonic Flowmeter*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0815	***Control Valve Types*** *Rotary ● Linear ● Valve Selection ● Price Comparison ● How to Choose the Right Valve ● Selection Guidelines ● Application Comparisons*
0815 – 0845	***Video Clips*** *Control Valve Assembly Break*
0845 – 0930	***Actuator Selection*** *Types of Actuators ● Linear Actuators ● Rotary Actuators ● Actuator Forces ● Positioners ● Fail Safe Systems*
0930 – 0945	*Break*
0945 – 1030	***Video Clips*** *Actuator Assembly*
1030 – 1100	***Process Considerations*** *End Connections ● Pressure Classes ● Face to Face Criteria ● Materials Selection ● Modes of Failure ● Leakage Rates*
1100 – 1130	***Video Clips*** *Valve Sealing*
1130 – 1200	***Practical Session*** *Valve Selection & Sizing*
1200 – 1230	***Video Clips*** *Control Valve Assembly*
1230 – 1245	*Break*
1245 – 1315	***Field Communications*** *Introduction ● Transmitter Classifications ● HART and 4-2-mA ● Driving the Circuit*
1315 – 1400	***Video Presentations*** *HART Communications*
1400 – 1420	***Safety Considerations*** *Intrinsic Safety ● Explosion-Proof* *Approval Standards ● Oxygen Service*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0900	***Basic Control Concepts*** *Variables ● Basic Elements ● Manual Control ● Feedback Control ● System Responses ● ON-OFF Control ● Three Term Control*
0900 – 0930	***Video Presentation*** *Three Term Control*
0930 – 0945	*Break*
0945 – 1100	***Modes of Control*** *Stability ● Ultimate Gain ● Tuning Methods ● Ratio Control ● Cascade Control ● Application Examples*
1100 – 1230	***Distributed Control Systems*** *Introduction ● Traditional Process Controller ● System Architecture ● DCS Types*
1230 – 1245	*Break*

1245 – 1330	***Programmable Logic Controllers*** *Introduction ● History ● Today's Position ● Principles of Operation ● System Components ● I/O Interfaces ● Configuration*
1330 – 1420	***SCADA Systems*** *Basic Definitions ● Levels of Hierarchy ● SCADA Configuration*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0900	***Safety Engineering*** *Introduction ● Standards ● Basic Fundamentals ● Safety Life Cycle ● Hazard Analysis ● Safety Requirements Specification*
0900 – 0930	***Video Presentation*** *HAZOP*
0930 – 0945	*Break*
0945 – 1100	***Safety Instrumented Functions*** *Definition ● Example of a Safety Function ● What a SIF is ● What a SIF is not ● How SIF fits with SIS and SIL ● Summary ● Bibliography*
1100 – 1230	***Safety Integrity Level*** *Introduction ● Definition ● Selection Procedure ● Practical Examples*
1230 – 1245	*Break*
1245 – 1420	***Safety Instrumented Systems*** *Introduction ● Probability of Failure ● System Architecture ● Safety PLC ● Major Systems ● Typical Questions & Answers*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Alarm Management*** *Introduction ● Architecture ● Update Times ● Speed of Response ● Operator Considerations ● Alarm Displays ● Alarm Priorities ● Alarm Functions ● Seven Steps to Alarm Management*
0830 – 0930	***Video Presentation*** *Explosion at BP Texas City Refinery*
0930 – 0945	*Break*
0945 – 1130	***Future Trends*** *Measurement Technology ● Control System Technology ● Communication Technology*
1130 – 1230	***Video Presentation*** *3 Beam Ultrasonic Flowmeter*
1230 – 1245	*Break*
1245 – 1345	***Case Studies*** *Piper Alpha Disaster ● Bhopal Gas Tragedy ● Chernobyl Disaster*
1345 – 1400	***Addendums*** ***Review, Wrap-up Session & Course Conclusion***
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” , “RSLogix 5000” , “Logix5555” , “Schneider Electric Magelis HMISTU” , “Automation Simulator” , “Gas Ultrasonic Meter Sizing Tool”, “Liquid Turbine Meter and Control Valve Sizing Tool”, “Liquid Ultrasonic Meter Sizing Tool” and “Orifice Flow Calculator”.

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

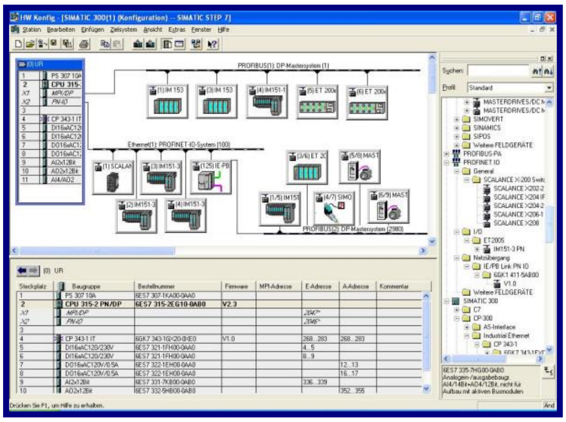
Siemens S7-1200 Simulator

Siemens S7-400 Simulator

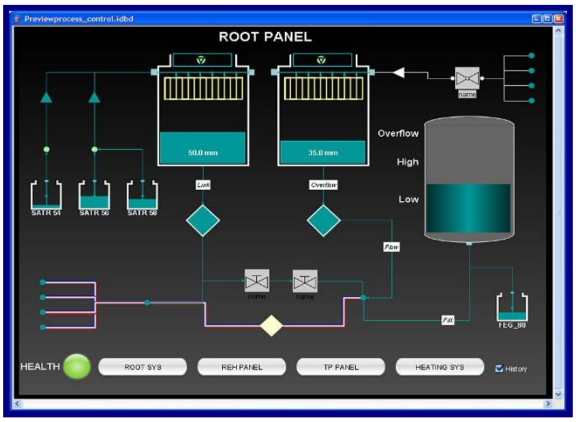
Siemens SIMATIC S7-300

Siemens S7-200 Simulator

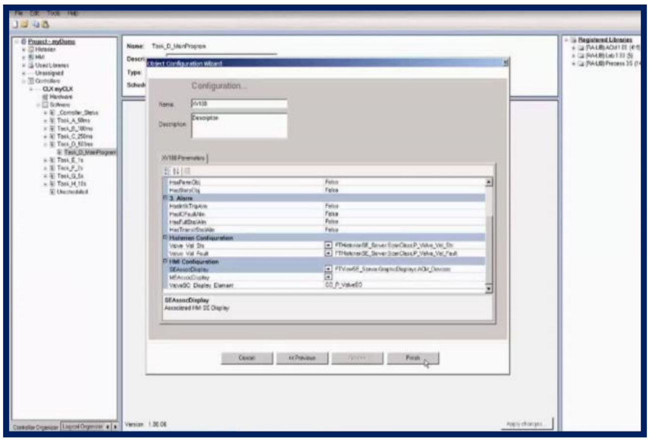
GE Fanuc Series 90-30 PLC Simulator



Siemens SIMATIC Step 7 Professional Software



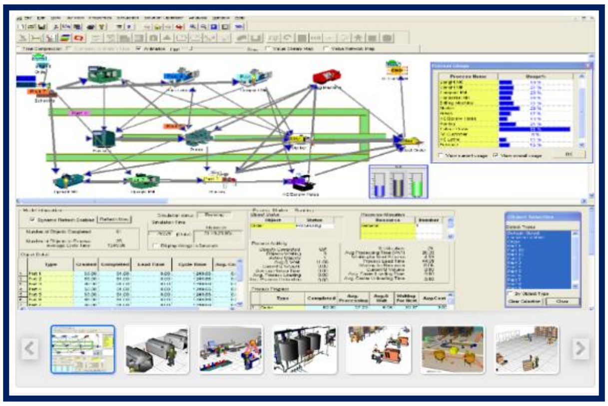
HMI SCADA



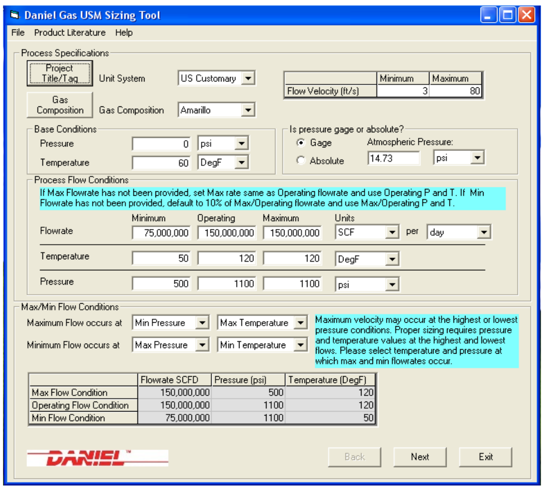
RSLogix 5000

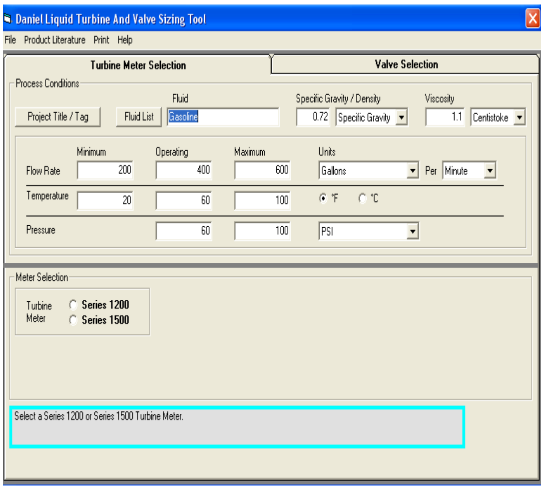
Logix5555

Schneider Electric Magelis HMISTU



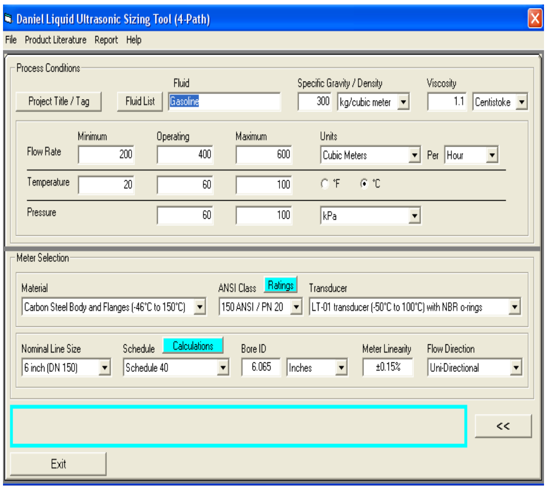
Automation Simulator



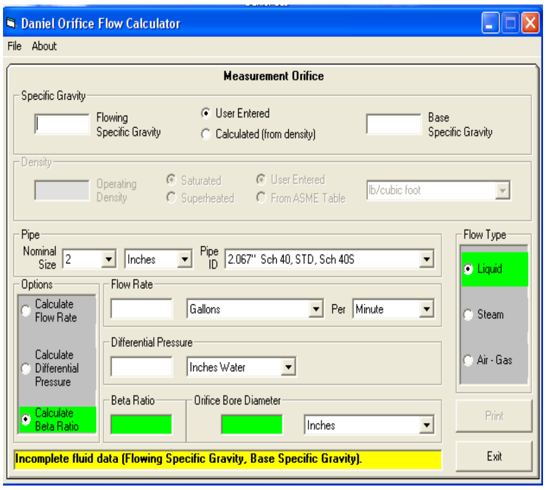


Gas Ultrasonic Meter (USM) Sizing Tool Simulator

Liquid Turbine Meter and Control Valve Sizing Tool Simulator



Liquid Ultrasonic Meter Sizing Tool Simulator



Orifice Flow Calculator Simulator

Course Coordinator

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