

COURSE OVERVIEW IE0740
Introduction to Instrumentation & Control Systems

Course Title

Introduction to Instrumentation & Control Systems

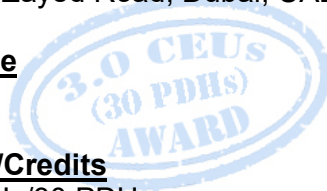
Course Date/Venue

Session 1: April 28-May 02, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
 Session 2: October 26-30, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE



Course Reference

IE0740



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.



This course is designed to provide participants with a detailed and up-to-date overview of Introduction to Instrumentation & Control Systems. It covers the introduction to instrumentation and process control, the terminology and the components of field instrumentation control loops; the industrial pressure measurement, its basic principles and practical methods for pressure measurements; the industrial temperature measurement, industrial level measurement and industrial flow measurement; the control valve, the terminology, main parts and how it works; the industrial process control; the definitions and theory of process control system; and the terminology associated with process control system.



During this interactive course, participants will learn the modes of control; the PID control system, the integral reset action and the derivative or rate action; the PLC control system, the principles of operation, system components, relay logic, ladder logic, timers and counter; the DCS control systems, its features, advantages, components, DCS block diagrams, architecture and redundancy concepts; and the control valves, its technology, advantages, disadvantages and good installation practices.

Course Objectives

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

- Apply and gain a good working knowledge on introduction to instrumentation and control systems
- Discuss instrumentation and process control covering its terminology and components of field instrumentation control loops
- Recognize industrial pressure measurement, its basic principles and practical methods for pressure measurements
- Define industrial temperature measurement, industrial level measurement and industrial flow measurement
- Discuss control valve, its terminology and main parts and explain how it works
- Describe the industrial process control covering its definitions and theory of process control system and terminology associated with process control system
- Identify the modes of control and apply hands-on practical training on digital controllers
- Explain PID control system, the integral reset action and the derivative or rate action
- Define PLC control system including its principles of operation, system components, relay logic, ladder logic, timers and counter
- Describe DCS control systems comprising of its features, advantages, components, DCS block diagrams, architecture and redundancy concepts
- Discuss control valves, its technology, advantages, disadvantages and good installation practices

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 fundamentals of industrial instrumentation and process control for any person who will be working on a daily basis with instrumentation and process control.

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)

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: -

- 

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. 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, Process Instrumentation** and Control Techniques, **Instrumentation** for Process Optimization and Control, Process Automation and **Instrumentation** Systems

Integration, Troubleshooting in Process Control Systems, Process Control & Safeguarding, **Troubleshooting Instrumentation** and Control Systems, GC Processes **Troubleshooting** and Control Systems, Practical **Troubleshooting** and Repair of Electronic Circuits, Process Control, **Troubleshooting & Problem Solving**. Process Control (PCI) & Safeguarding, **Control Loop & Valve Tuning, Controller Maintenance** Procedures, High Integrity Protection Systems (HIPS), **Instrument Calibration & Maintenance, Instrumented Safety Systems, 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 **Adrioit**, 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, Electrical & Instrumentation 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 worldwide.

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	<i>Registration & Coffee</i>
0800 – 0815	<i>Welcome and Introduction</i>
0815 – 0830	PRE-TEST
0830 – 0930	Introduction to Instrumentation & Process Control <i>Definition of Terminology Associated with Industrial Process Instrumentation & Control System • Components of Field Instrumentation Control Loops (Sensors, Transducers, Transmitters Controllers & Control Valves) • Consideration of Safety & Abnormal Situations in Process Control System • Instrumentation Calibration Parameters (Range, Span & Zero Process Instrumentation Signals)</i>
0930 – 0945	<i>Break</i>
0945 – 1100	Industrial Pressure Measurement <i>Basic Principles • Practical Methods for Pressure Measurements • Calibration & Maintenance of Pressure Gauges & Ordering Pressure Gauges • Calibration & Configuration of Pressure Transmitters (Smart, Electronic & Pneumatic) Pressure Switches (Calibration, Set & Reset) • Applications of pressure Instruments in Industrial Control Systems</i>
1100 – 1230	Industrial Temperature Measurement <i>Industrial Thermocouples TC & Resistance Temperature Detectors RTDs • Test of TC & RTDs, Tables of TC & RTDs • Wiring & Calibration Thermocouple & RTDs Temperature Transmitter • Temperature Signal Converter (TC & RTDs) • Practical Training</i>
1230 – 1245	<i>Break</i>
1245 – 1420	Industrial Temperature Measurement (cont'd) <i>Calibration Procedures for Temperature Transmitter & Converter • Thermocouple & RTDs Applications in Industry • Digital Temperature Indicator Controllers • Handy Temperature Calibrator & Selecting a Dry-Well Temperature Calibrator • Temperature Switches (Calibration, Set & Reset) • Applications of Temperature Instruments in Control Systems</i>
1420 - 1430	Recap
1430	<i>Lunch & End of Day One</i>



Day 2

0730 – 0930	Industrial Level Measurement Level Measurement in Industrial Process • Level Gauges (Sight Glass Gauges, Float, Displacer, Magnetic Level Gauges) • Level Measurement by Hydrostatic Head for Open & Closed Tanks • Level Transmitters (Differential Pressure Transmitter, Displacer Transmitters, Magnetic Level Transmitter, Smart Level Transmitters) • Installation, Calibration and Configuration of Differential Level Transmitters (Smart, Electronic & Pneumatic) • Installation Considerations
0930 – 0945	Break
0945 – 1100	Industrial Level Measurement (cont'd) Ultrasonic Level Transmitter • Radar Level Transmitter • Installation, Calibration & Configuration of Ultrasonic & Radar Level Transmitters • Voltage/Current Calibrator • Level Switches (Calibration, Set & Reset) • Applications of Level Instruments in Control Systems • Video Presentation
1100 - 1230	Industrial Flow Measurement Differential Pressure Flowmeters • Non-Intrusive Flowmeters • Mass Flow Meters • Positive Displacement Meters • Installation Considerations • Ultrasonic Flow Measurement for Industrial Applications • Magnetic Flow Transmitter • Video Presentation
1230 – 1245	Break
1300 – 1420	Industrial Flow Measurement (cont'd) Digital Flow Meters & Counters Applications, Configuration & Calibration • Ultrasonic Flowmeter System for Custody Transfer of Oil & Oil Products
1420 - 1430	Recap
1430	Lunch & End of Day Two

Day 3

0730 – 0830	Control Valve Control Valve Terminology, Main Parts & How it Works • Valve Actuators, Diaphragm & Piston Actuator • Limit Switches & Proximity Limit Switch Wiring • Video Presentation
0830 – 0845	Break
0945 – 0945	Control Valve (cont'd) Valve Positioner & principle of Operation • Calibration of Electro Pneumatic Positioner • Rack & Pinion Automatic Valves, Solenoid Directional Valves • Video Presentation
0945 – 1230	Industrial Process Control Definitions & Theory of Process Control System & Terminology Associated with Process Control System • Process Control Variables & Applications • (Process Variable (PV), Manipulated Variable (MV) & Setpoint SP or Set Value (SV)
1230 – 1245	Break
1245 – 1420	Industrial Process Control (cont'd) Process Control Loops (Level, Pressure, Temperature, Flow) • Feedback Control & Feedforward • Applications Feedforward Plus Feedback • Video Presentation
1420 - 1430	Recap
1430	Lunch & End of Day Three



Day 4

0730 - 0930	Modes of Control On/Off Control Applications (Temperature & Level) • Open Loop & Closed Loop Diagrams • Manual & Automatic Control Comparison & Applications • Video Presentation
0930 - 0945	Break
0945 - 1100	Hands-on Practical Training (Digital Controllers) Wiring Inputs/Outputs & Operation of Process Controllers • Video Presentation
1100 - 1230	Types of Control Loop Diagrams (P&ID Reading & Interpretation Design & Installation of Field Process Control System • Multivariable Loops
1230 - 1245	Break
1245 - 1420	PID Control System Control Algorithm (Three-Term PID) PID Controller Modes • Proportional, Integral or Reset & Derivative or Rate Action • Proportional Control (P) • Proportional Control Algorithm, Offset & Manual Reset • Proportional Gain, Proportional Band, Limits of Proportional Action, Direction of Control Action (Direct & Reverse Action) • Bumpless Transfer Between Manual & Automatic Control System • Setting Values of Gain & Proportional Band • Tuning of Proportional of Proportional Control System
1420 - 1430	Recap
1430	Lunch & End of Day Four

Day 5

0730 - 0830	Integral (Reset) Action Integral Action Eliminates Offset • Setting Value of Integral or Reset Time • Proportional-Integral Control applications • Tuning PI Process Control Loops • Cascade Control Ration and Ration Control • Video Presentation
0830 - 0930	Derivative or Rate Action Setting Value of Derivative or Rate Action • Tuning PID Controller • Methods of Tuning PID Controller • Setting Tuning Parameters P, I, D & Applications • Troubleshooting of PID Control Loops • Video Presentation
0930 - 0945	Break
0945 - 1130	PLC Control System Introduction • Principles of Operation • System Components • Relay Logic • Ladder Logic • Timers • Counter
1130 - 1230	DCS Control Systems Introduction • Overview • Features • Advantages • I/O • Components • DCS Blocks Diagrams • Architecture • Redundancy Concepts
1230 - 1245	Break
1245 - 1300	Control Valves - Technology, Advantages/Disadvantages & Good Installation Practices Different Types of Process Control Utilizing Valves • Valve Bodies & Valve Trim • Actuators • Electric vs. Pneumatic • Reciprocating vs. Rotary • Fail Positions • I/P's Positioners and other Signal Converters • Regulators & Pressure Relief Valves
1300 - 1400	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”, “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



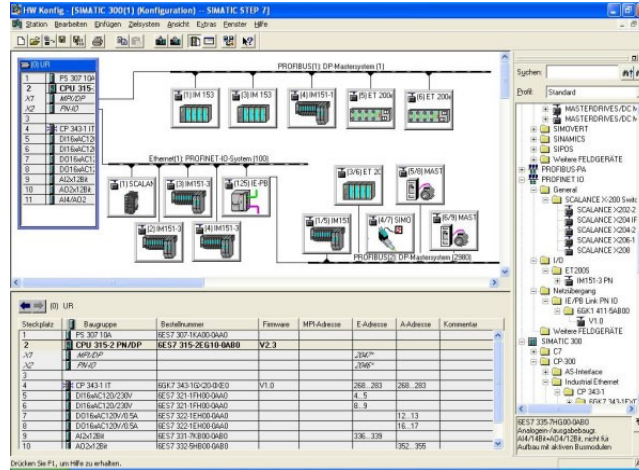
Siemens SIMATIC S7-300



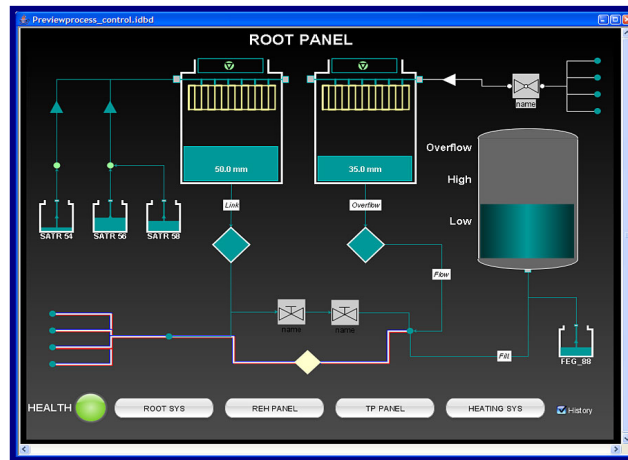
Siemens S7-200 Simulator



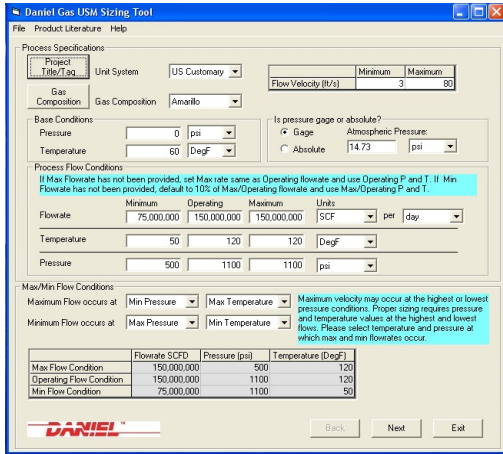
GE Fanuc Series 90-30 PLC Simulator



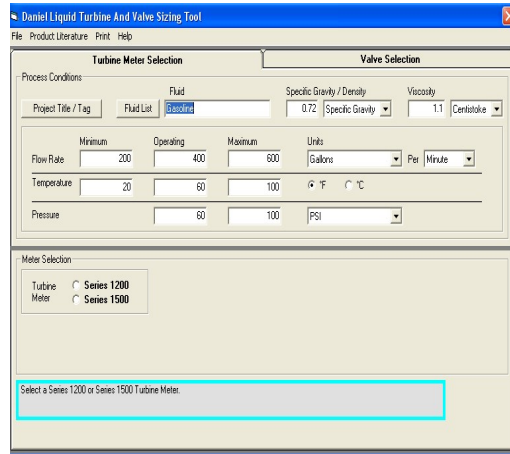
Siemens SIMATIC Step 7 Professional Software



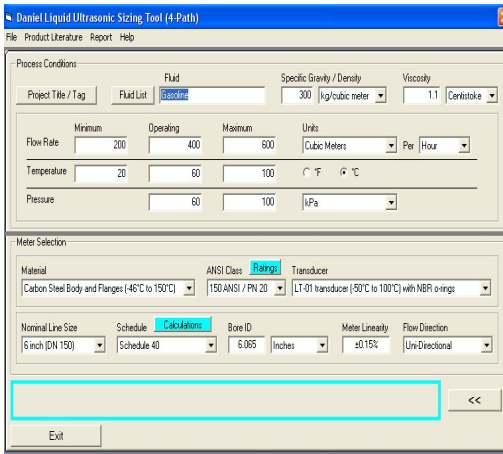
HMI SCADA



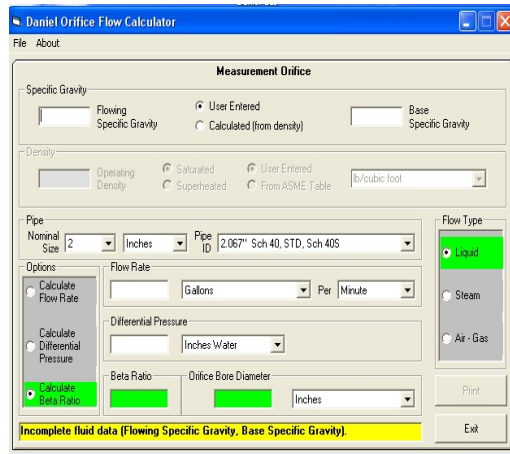
Gas Ultrasonic Meter (USM) Sizing Tool Simulator



Liquid Turbine Meter and Control Valve Sizing Tool Simulator



Liquid Ultrasonic Meter Sizing Tool Simulator



Orifice Flow Calculator Simulator

Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org