COURSE OVERVIEW IE0570
Instrumentation for Non-Instrumentation Engineers

Course Title
Instrumentation for Non-Instrumentation Engineers

Course Date/Venue
August 24-28, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
IE0570

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.

Instrumentation is the science and art of measuring the value of some plant parameters such as pressure, flow, level or temperature and supplying a signal that is proportional to the measured parameter. The output signals are standard signal and can then be processed by other equipment to provide indication, alarms or automatic control. This course will clearly explain the concepts and implementation of instrumentation. It will identify and define the physical properties that must be considered in the proper installation, calibration, and use of a measurement device, with ample information on the parameters that must be adapted to achieve accuracy, regardless of the device's make and model.

This course is designed to provide a good overview of the instrumentation technology to non-instrumentation engineers. Further, the course can serve as a refresher for instrumentation engineers involved with process measurement and control equipment. The course covers a wide range of topics such as theory & application, pressure measurement, level measurement, temperature measurement, flow measurement, flowmeter selection & costs, basic principles of control systems, modes of control, typical applications, digital field communications, smart transmitter, P&ID, wiring schematics & diagrams, control valves and process considerations.

The course includes a practical workshop on control valve computer programming that covers selection, sizing and actuator force diagram. Each topic of the course 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 a good working knowledge on the theory & application of instrumentation including the familiarization of basic measurement & control theory used in the implementation of instrumentation
- Implement the basic principles of pressure measurement, electrical & mechanical pressure transducers and the future technologies related to pressure measurement
- Enumerate the main types of level measurement, installation considerations and the future technologies related to level measurement
- Explain the principles of temperature measurement, thermistors and the future technologies related to temperature measurement
- Carryout the principles of flow measurement, flowmeter classification and future technologies related to flow measurement
- Explain the initial and cost considerations as well as the proper meter selection in the selection & costs of flowmeter and enumerate the typical applications used in instrumentation
- Enumerate the basic control concepts including the variables, basic elements and feedback control as well as the modes of control related to instrumentation
- Identify the different field communications used in instrumentation and become familiar with P & ID, wiring schematics & diagrams
- Apply the principles of control valves including its body types, cavitation, valve coefficient and control valve selection
- Enumerate the actuators & accessories of control valves including the main types of actuators and positioners
- Identify the process considerations, materials selection and modes of failure in instrumentation as well as the safety considerations
- Distinguish current trends in instrumentation as well as learn the principles of density measurement and temperature notes

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

The course is primarily designed for non-instrumentation engineers who have to perform occasional instrumentation responsibilities as part of their job. The course also provides a good introduction for newly graduated instrumentation engineers or others who have a good working knowledge of the fundamentals but have limited operating experience.

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. Barry Pretorius is a **Senior Instrumentation Engineer** with almost **30** years of extensive experience within the **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise widely covers in the areas of **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/ Philsing, **Information Security Manager**, **Security System** Installation and Maintenance, Security of Distributed Control System (**DCS**), Process Control, Instrumentation, Safeguarding & Security, Programmable Logic Controller (**PLC**), **Siemens PLC** Simatic S7-400/S7-300/S7-200, **PLC & SCADA** for Automation & Process Control, **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.

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 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, 24th of August 2025***

0730 – 0745	*Registration & Coffee*
0745 – 0800	*Welcome & Introduction*
0800 – 0815	***PRE-TEST***
0815 – 0845	***Review of Course*** *Objectives of the Course ● Timetables*
0845 – 0930	***Theory & Application*** *Control History ● Basic Measurement Concepts ● Performance Terms ● Basic Control Theory*
0930 – 0945	*Break*
0945 – 1100	***Pressure Measurement*** *Basic Principles ● Pressure Transducers–Mechanical ● Pressure Transducers–Electrical ● Installation Considerations ● Selection Guidelines ● Future Technologies*
1100 – 1215	***Level Measurement*** *Main Types ● Simple Sight Glass ● Gauging Rods ● Buoyancy Tape Systems ● Hydrostatic Pressure ● Ultrasonic Measurement ● Radar Measurement ● Vibration Switches ● Radiation Measurement ● Electrical Measurement ● Installation Considerations ● Future Technologies*
1215 – 1230	***Video Presentation*** *Radar Level Measurement*

1230 – 1245	*Break*
1245 – 1420	***Temperature Measurement*** *Principles ● Thermocouples ● Resistance Temperature Detectors (RTD's) ● Thermistors ● Non-Contact Types ● Future Technologies*
1420 – 1430	***Recap*** *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, 25th of August 2025***

0730 – 0900	***Principles of Flow Measurement*** *Terminology ● Flow Profiles ● Measurement of Flow ● Flowmeter Classification*
0900 – 0915	*Break*
0915 – 1100	***Flow Measurement*** *Basic Flow Theory ● Differential Pressure Flow Measurement ● Oscillatory Flow Measurement ● Magnetic Flowmeters ● Ultrasonic Flow Measurement ● Mass Flow Meters ● Installation Considerations ● Impact on Overall Loop ● Future Technologies*
1100 – 1115	***Video Presentation*** *Coriolis Flowmeter*
1115 – 1230	***Flowmeter–Selection & Costs*** *Initial Considerations ● Meter Selection ● Cost Considerations*
1230 – 1245	*Break*
1245 – 1415	***Typical Applications*** *Radar Level ● Density ● Meter Prover Test Rig ● Low Flow Rate Applications ● Pressure ● Averaging Temperature Probe*
1415 – 1420	***Video Presentation*** *Flowmeter Calibration*
1420 – 1430	***Recap*** *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, 26th of August 2025***

0730 – 0845	***Basic Control Concepts*** *Introduction ● Variables ● Basic Elements ● Manual Control ● Feedback Control ● System Responses ● On–Off Control ● Three Term Control*
0845 – 0900	***Video Presentation*** *Three Term Control*
0900 – 0915	*Break*
0915 – 1030	***Modes of Control*** *Stability ● Ultimate Gain ● Tuning Procedures ● Ratio Control ● Cascade Control ● Feedforward Control*

1030 – 1215	*Field Communications* *Analogue Signals ● Digital Communications ● Fieldbus Technologies ● A/D Conversion*
1215 – 1230	*Video Presentation* *HART Communication*
1230 – 1245	*Break*
1245 – 1420	***P & ID, Wiring Schematics & Diagrams*** *Block Flow Diagrams ● Process Flow Diagrams ● Mass Balance ● Piping & Installation Diagrams ● P & ID Symbols ● HAZOP ● P & ID Standards ● Valves ● Standardisation of Symbols ● Schedules ● Layout Drawings*
1420 – 1430	***Recap*** *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, 27th of August 2025***

0730 – 0915	***Control Valves–Body Types*** *Principles of Control Valves ● What Happens Inside a Control Valve? ● Choked Flow ● Cavitation ● Flashing ● Valve Coefficient (Cv) ● Control Valve Types ● Valve Characteristics ● Trim Characteristics ● Control Valve Selection ● Leakage Rates*
0915 – 0930	***Video Clip*** *Valve Body Assembly*
0930 – 0945	*Break*
0945 – 1100	***Control Valves–Actuators & Accessories*** *Main Types of Actuators ● Linear Actuators ● Rotary Actuators ● Actuator Forces ● Positioners ● Fail Safe Actuators*
1100 – 1200	***Practical Session*** *Control Valve Sizing with Computer Programme*
1200 – 1215	*Break*
1215 – 1300	***Process Considerations*** *End Connections ● Pressure Classes ● Face to Face Criteria ● Materials Selection ● Modes of Failure ● International Standards*
1300 – 1420	***Guest Speaker*** *Presentation of the Rosemount 3051 Smart DP Transmitter (If available)*
1420 – 1430	***Recap*** *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, 28th of August 2025***

0730 – 0930	***Safety Considerations*** *Intrinsic Safety ● Explosion-Proof ● Approval Standards ● Oxygen Service*
0930 – 0945	*Break*
0945 – 1100	***Current Trends*** *Measurement Technology ● Control System Technology ● Communication Technology ● Calibration Industry*
1100 – 1215	***Video Presentation*** *Ultrasonic Flowmetering*
1215 – 1230	*Break*
1230 – 1345	***Addendums*** *Density Measurement ● Temperature Notes ● Other Subjects as Required*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
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

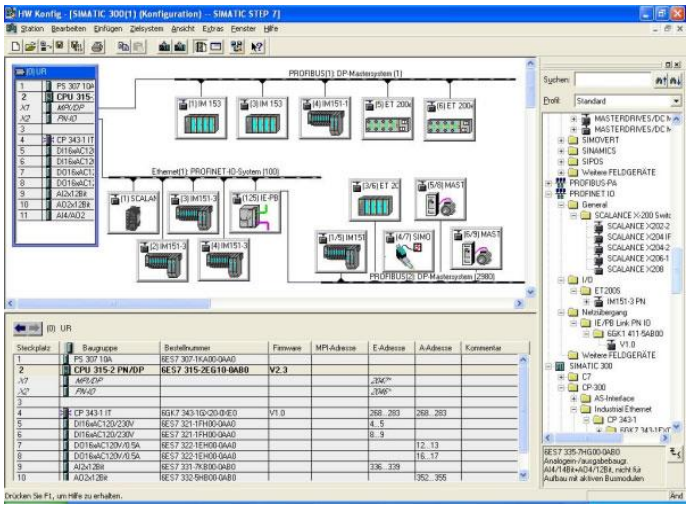
Siemens S7-1200 Simulator

Siemens S7-400 Simulator

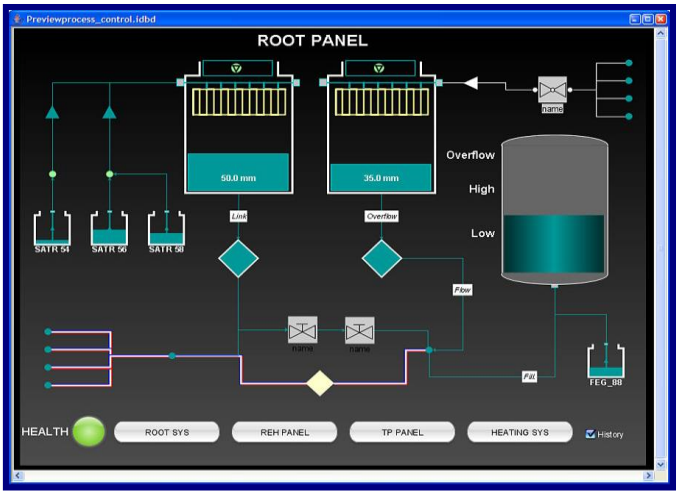
Siemens SIMATIC S7-300

Siemens S7-200 Simulator

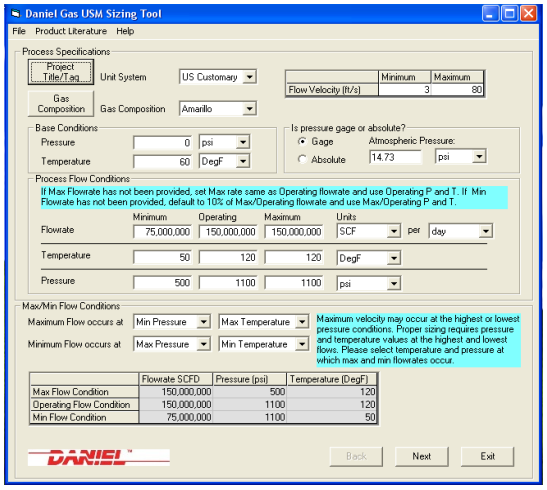
GE Fanuc Series 90-30 PLC Simulator



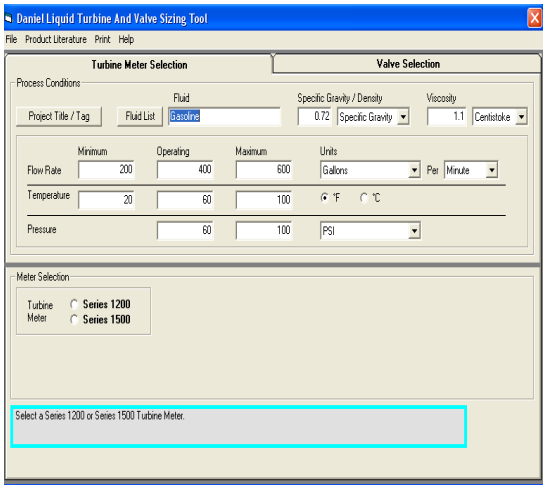
Siemens SIMATIC Step 7
Professional Software



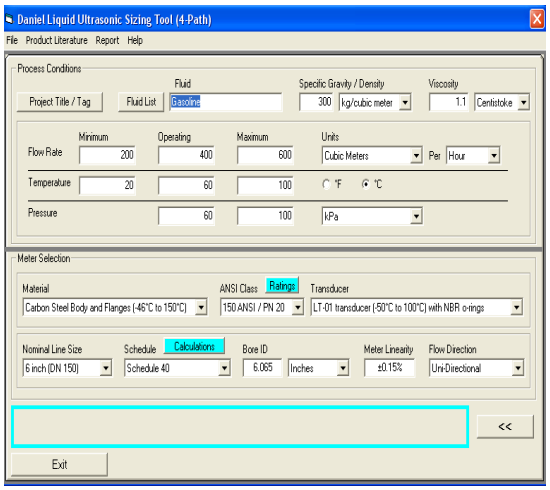
HMI SCADA



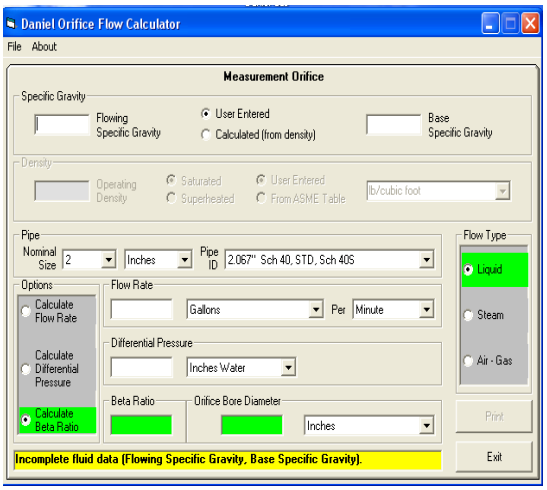
Gas Ultrasonic Meter (USM) Sizing Tool Simulator



Liquid Turbine Meter and Control Valve Sizing Tool Simulator



Liquid Ultrasonic Meter Sizing Tool Simulator



Orifice Flow Calculator Simulator

Course Coordinator

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