COURSE OVERVIEW IE0585
Basic Fundamentals of Plant & Equipment Control Systems

Course Title
Basic Fundamentals of Plant & Equipment Control Systems

Course Date/Venue
Session 1: February 11-15, 2024/The Mouna Meeting Room, The H Dubai Hotel, Sheikh Zayed Rd - Trade Centre, Dubai, UAE
Session 2: March 03-07, 2024/Oryx Meeting Room, Doubletree By Hilton Doha-Al Sadd, Doha, Qatar

Course Reference
IE0585

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 participants with a detailed and up-to-date overview of basic fundamentals of plant & equipment control systems. It covers the basic fundamentals of plant and equipment control system; the pressure measurement, temperature measurement, level measurement and flow measurement; the control valve types and actuators as well as process valve considerations and leakage rates; the principles of process control and determine types and properties of control loops; and the field communications systems, distributed control systems, yokogawa CENTUM, programmable logic controllers and SCADA systems.

During this interactive course, participants will learn the introduction safety instrumented systems, safety integrity level and safety instrumented systems; the instrument maintenance systems and integrity and differentiate quality factors precision, accuracy, standards deviation and variance and the flow-meter proving systems and prover systems.

Course Objectives

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

- Apply and gain an in-depth knowledge on basic fundamentals of plant & equipment control systems
- Discuss the basic fundamentals of plant and equipment control system
- Differentiate pressure measurement, temperature measurement, level measurement and flow measurement
- Define control valve types and actuators as well as process valve considerations and leakage rates
- Recognize principles of process control and determine types and properties of control loops
- Describe field communications systems, distributed control systems, yokogawa CENTUM, programmable logic controllers and SCADA systems
- Discuss the introduction safety instrumented systems, safety integrity level and safety instrumented systems
- Employ instrument maintenance systems and integrity and differentiate quality factors precision, accuracy, standards deviation and variance
- Define flow-meter proving systems and prover systems

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, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides a basic overview of all significant aspects and considerations of industrial instrumentation and modern control systems for engineers and other technical staff who are involved in the selection, operation and troubleshooting of control and instrumentation systems.

Accommodation

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

Course Fee

Dubai	**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.
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.

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.

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:

Dr. Mike Tay, PhD, MSc, BSc, is a **Senior Electrical**, **Instrumentation & Communications Engineer** with over **40 years** of extensive experience. His expertise widely covers in **Cable & Over Head Line**, **Electrical Drawing**, **Electrical, Distribution Networks**, **Electrical Forecasting**, **Protective Devices** Troubleshooting, **Protective Devices** Testing & Maintenance, **Uninterruptible Power Supply** (**UPS**) Design, Industrial **UPS Systems & Battery Power Supplies** Maintenance & Troubleshooting, **UPS & Battery** System, **Battery & Battery Charger & UPS** and Measurement Devices, UPS **System & Battery Chargers** Maintenance & Troubleshooting, **UPS & Battery** Design, Operation, Maintenance & Troubleshooting, UPS **Operation & Alarm Panel** Reading, **Circuit Breaker**, **HV Switchgear Operation & Maintenance**, **HV/LV Equipment**, **High Voltage Electrical Safety**, **LV & HV Electrical System**, **HV Equipments Inspection & Maintenance**, **LV Distribution Switchgear & Equipment**, **Power Generation Operation & Control**, **Power System Generation and Distribution**, **Power System Protection & Relaying**, **Modern Power System Protective Relaying**, **Protection Relay Maintenance**, **Application** & **Testing**, **System Analysis**, **Power System Faults**, **Protection Scheme Components, Current** & **Voltage Transformers**, **Power System Neutral Grounding**, **Feeder Overcurrent Protection**, **Electrical Protection Systems**, **Bus Protection**, **Motor Protection**, **Starting** & **Control**, **Transformer Protection**, **Generator Protection**, **Capacitor Protection**, **Numerical Relays**, **SCADA Security**, **ESD System Analysis** & **Control**, **Electrical** & **Instrumentation**, **Installation & Inspection**, **Custody Measurement**, **Loss Control** for **Petroleum Products**, **Process Control** & **Instrumentation**, **Fiber Optics Access Network Planning**, **Safety Instrumented System** (**SIS**), **Safety Integrity Level** (**SIL**), **PLC Design**, **Power System**, **Power Supply Design Management**, **Basic Electronics & Transformers**, **Diesel Generator**, **Electric Motors**, **Electrical Fundamentals**, **Basic Electricity** & **Electrical Codes**. Further, he is also well-versed in **Communications**, **Telecommunications**, **Mobile Protocols**, **4G LTE**, **GSM/UMTS**, **CMDA2000**, **WIMAX Technology**, **HSPA+**, **Alarm Management System**, **Computer Architecture**, **Logic & Microprocessor Design**, Embedded Systems Design plus **Computer Networking** with **CISCO**, **Network Communication**, **Industrial Digital Communication**, **Designing Telecommunications Distribution System**, **Electrical Engineering**, **WiMAX Broadband Wireless System**, **TT Intranet** & **ADSL Network**, **TT Web** & **Voicemail**, **Off-site ATM Network**, **IT Maintenance**, **Say2000i**, **IP Phone**, **National Address** & **ID Automation**, **Electricity Distribution Network**, **Customs Network** & **Maintenance**, **LAN** & **WAN Network**, **UYAP Network**, **Network Routing Protocols**, **Multicast Protocols**, **Network Management Protocols**, **Mobile** & **Wireless Networks** and **Digital Signal Processing**. **Currently**, he is the **Technical Advisor** of **Izmir Altek**.

During his career life, Dr. Tay worked with various companies such as the **KOC Sistem**, **Meteksan Sistem**, **Altek BT**, **Yasar University**, **Dokuz Eylul University**, **METU** and occupied significant positions like the **Aegean Region Manager**, **Group Leader**, **Technical Services Manager**, **Field Engineer**, **Research Assistant**, **Instructor**, **Technical Advisor** and the **Dr. Instructor**.

Dr. Tay has **PhD**, **Master's** and **Bachelor's** degree in **Electrical & Electronic Engineering** from the **Dokuz Eylul University** and the **Middle East Technical University** (**METU**) respectively. Further, he is a **Certified Instructor/Trainer**, **Technical Trainer (Australia)**, **Trainer** for **Data-Communication System (England & Canada)**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), a **Certified CISCO** (**CCSP**, **CCDA**, **CCNP**, **CCNA**, **CCNP**) **Specialist**, a **Certified CISCO IP Telephony Design Specialist**, **CISCO Rich Media Communications Specialist**, **CISCO Security Solutions** & **Design Specialist** and **Information Systems Security** (**INFOSEC**) **Professional**. He has delivered and presented innumerable training courses and workshops worldwide.

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	***Basic Fundamentals of Plant & Equipment Control Systems*** *Introduction to Process Measurement ● Why Instruments? ● Where do We Need Instruments? ● What Instrument Types are there? ● What Types of Control are There? ● Control History ● Process Control ● What is a Measurement? ● Measurement Standards ● Units & Systems ● Measurement Related Issues ● Definition of Accuracy ● The Accuracy of Measurement Achieved is Mainly Influenced by Factors ● Other Important Definitions ● Precision / Repeatability ● Some Issues Related to Measurement ● Calibration ● Measurement Calibration ● Measurement Errors ● Systematic vs. Random Errors ● Hysteresis ● Resolution ● Confidence Level ● Types of Errors ● Competence Requirements and Risk ● Basic Measurement Definitions ● Ways to Indicate Accuracy ● Repeatability ● STD, Precision, Repeatability and Reproducibility ● Theory & Application ● P & ID Symbols ● What are Standard Instrumentation Signals ● What are Smart Transmitters ● Typical Applications*
0900 – 0915	*Break*
0915 – 1015	***Pressure Measurement*** *Pressure Property ● Gas Pressure ● Pressure, Force & Area ● Types of Pressure Measurement ● Types of Pressure ● Pressure Unit Conversion ● Pressure Instruments ● Diaphragm Seal System ● Diaphragm Seal ● Pressure Gauge Selection Guideline ● Pressure Transmitter ● Main Types of Pressure Sensing Elements ● Bourdon Type Pressure Gauge ● Pressure Gauges ● Strain Gage Pressure Sensor ● Capacitance Type Pressure Sensing Element ● Types of Pressure Sensing Elements ● Piezo Type Radar Sensing Elements ● Types of Pressure in a Fluid System ● Static, Dynamic & Total Pressure ● Bernoulli's Equation*
1015 – 1245	***Temperature Measurement*** *Temperature Measurement ● Thermocouples ● Resistance Temperature Detectors ● Thermistors ● Non-Contact Measurement ● Infra Red Measurement ● Radiation Pyrometer ● Installation Considerations*
1245 – 1300	*Break*
1300 – 1430	***Level Measurements*** *Topics ● Main Types ● Applied Types of Level Measurement ● Level Type Sensor Selection ● Buoyancy Tape Systems ● Servo tank gauging systems ● Principle of Servo tank gauging system ● Industry Approvals ● Industrial Approvals ● Hydrostatic Pressure Level Measurement ● Bubble Tube Method ● Weighing Method ● Ultrasonic Level Measurement ● Radar Level Measurement ● Vibrating type Switches*
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

0730 – 0800	***Level Measurements (cont'd)*** *Level Measurement - Float Level Switches ● Electrical Conductivity Level Measurement ● Electrical Capacitive Level Measurement ● Level Measurement Installation Considerations ● Wavelengths and Photon Energy Overview ● Nuclear Type Level Measurement Application ● Level Measurement*
0800 – 0900	***Flow Measurements*** *Measurement Range ● Measurement Terms ● Turndown Ratio / Rangeability ● Flow Measurements ● Totalised Flow ● Flow-meters & Classification ● OIML – R recommendation Scope ● Flow Meters & Classification ● Turbine Flow-meter*
0900 - 0915	*Break*
0915 – 1115	***Flow Measurements (cont'd)*** *Typical Calibration Curve ● Positive Displacement Flow-meters ● Viscosity Limits of Rotameters: Depend on Float Shape ● Variable Area Flow-Meter ● Thermal Mass Flow-Meter ● Δ P Flow Devices ● Differential pressure flow-meters ● Orifice Type ● Dall Tube Low Loss Meter ● Head Loss ● Pitot Tube Type Flow Meter ● Doppler Type Flow meters ● Coriolis Mass Flow Measurement ● Electromagnetic type Flowmeter ● Magnetic Flow Measurement ● Magnetic Flow meter Principle ● Magnetic Flow meter ● Magnetic Flow Measurement ● Flow Measurements Overview*
1115 – 1215	***Control Valve Types*** *What is a Control Valve? ● Control Valve Symbols ● Control Valve Terminology ● Control Valve Flow Coefficient ● Control Valve Cv Computations ● Control Valve Failing Positions ● Control Valve Action Types ● Chocked Flow, Cavitation and Flashing ● Pressure Recovery Factor ● Cavitation ● Flashing ● Preventing Cavitation and Cavitation Damage ● Pressure Recovery Factor ● Rotary Valves ● Butterfly Valves ● Eccentric Type Disk Valves ● Other Types Rotary Valves*
1212 – 1230	*Break*
1230 – 1300	***Control Valve Types (cont'd)*** *Ball Valves ● Ball Valves – Soft Seated ● Ball Valves - Metal Seated ● Plug Valves ● Plug Type Control Valve ● Linear Valves ● Globe Valves ● Linear Type - Globe Valves*
1300 – 1420	***Control Valve Types & Actuators*** *Cage Valves ● Cage-Guided Valve Characterization ● Linear Type - Cage Valve ● Control Valve Selection - Flow Characteristics ● Application Control Valve Flow Characteristics ● Control Valve Flow Characteristics ● Overview Control Valve Flow Characteristics ● Indicative Valve Price Comparison ● How to Select the Right Valve? ● Control Valves ● Control Valve Types - Some Special Types of Valves ● Streamlined angle valve with lined venturi outlet ● Angle Body Valve ● Split body valve ● Three-way diverting valve ● Three-way mixing valve ● Application Comparisons ● Application Comparisons ● Control Valve Actuators ● Hydraulic Actuator Systems ● Control Valve Positioners ● Emergency Shut-Down Valves ● Intelligent Valve Positioners ● Intelligent Valve Positioners ● Features Intelligent Valve Positioners*
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

0730 – 0830	***Process Valve Considerations & Leakage Rates*** *Process Considerations - Flanged Type Process Connections*
0830 – 0930	***Principles of Process Control*** *Reasons for Process Control ●Standard Terminology and Symbols ● Control Theory & Practice ● Summary of Reasons for Process Control ● Process Control Terminology ● Response Time of the Instrument ● Time Lag ● Main Parts of a Control Valve ● Final Control Element => Control Valve ● Process Control Terminology ● Control Theory & Practice ● Control Principle ● Control Systems ● DCS Systems ● DCS Faceplate features ● Error ● Error Properties ● Basic Control Concepts ● Open Loop and Closed Loop Control ● Control Theory*
0930 – 0945	*Break*
0945 - 1115	***Principles of Process Control (cont'd)*** *Control Parameters ● Control Loop ● Control Action ● Control Action examples ● Self-regulating Control ● Control Offset ● Proportional Offset ● Proportional Action (Closed Loop) ● Load Disturbance ● Process Capacity & Controller Gain ● Control Algorithm ● Programmable Logic Controllers ● On/off Temperature Control ● Proportional Band ● Process Response Curve ● Typical Control Responses ● Integral Control Action ● Integral ActionControl Algorithm - Integral Action ● Phase Shift of Integral Action = 90˚lag ● Derivative Control Action ● Derivative - Control Algorithm ● Understanding Derivative Action ● Derivative has a Phase Lead of 90˚ ● Controller Selection ● Controller Setting ● Pressure Control Loop ● Temperature Control Loop ● Flow Control Loop ● Basic Control Loop ● Advance Control Loop ● Tuning the Controller ● Trial-and-Error Tuning ● Control System ● Control Strategy Development*
1115 – 1215	***Types and Properties of Control Loops*** *Control Loops ● Basic Control Loop ● Types of Control Loops ● Feed Forward Control ● Feedback Control ● Control Strategy ● Combined Feedback and Feed Forward Control ● Advance Control Loop*
1215 – 1230	*Break*
1230 – 1330	***Field Communication Systems*** *Transmitter Classifications ● Transmitter Power Options ● HART and 4 – 20 mA ● Driving the Circuit ● Digital Field Communications*
1330 – 1420	***Distributed Control Systems*** *Introduction ● Control Systems Trend ● Control Systems History ● Control Systems Development ● Earlier type of separate Micro Processor based system ● Distributed Control System Levels ● Functions & Features ● Control & Monitoring ● Operator Interface ● Application Software*
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

0730 – 0800	***Distributed Control Systems (cont'd)*** *Traditional Process Controllers ● Several Loops Sharing The Same Digital Controller ● DCS System Architecture ● Evolution of DCS Architecture ● ABB DCS Freelance 2000 AC800F ● Other Modules ● Data Historian / Trends ● Control Modules ● Yokogawa CS3000 Platform*

0800 – 0830	***Distributed Control Systems*** *DCS Types ● Honeywell Experion System Architecture ● Logic Manager ● Emerson Delta V ● Delta V – M Series ● DeltaV Cabinet ● Emerson Delta V – System Architecture ● Foundation Fieldbus Interoperability is actually standard ● Integration of SIS - Foundation Fieldbus » DeltaV ● Emerson Delta V ● Emerson Delta V – Wireless feature*
0830 – 0900	***Yokogawa CENTUM*** *Distributed Control Systems ● Human Interface Station ● Quick Review of Vnet /IP Features ● System Overview ● Field Control Station ● Foxboro I/A System ● New Developments -DCS*
0900 - 0915	*Break*
0915 – 1045	***Programmable Logic Controllers*** *Introduction ● History ● Telemecanique – 'Modicon' M340 PLC system ● Allen-Bradley 'Micrologix' PLC's ● Principles of Operation ● Programmable Controller Block Diagram ● Block Diagram of major CPU components ● Illustration of a Scan Sequence ● Input / Output Interface ● System Components ● Functional Interaction of a PLC System ● System Components ● Illustration of a PID control function via PLC ● Configuration*
1045 – 1145	***SCADA Systems*** *What is a SCADA system? ● SCADA - Overview Main Parts ● SCADA Systems ● SCADA Master ● SCADA Communication Media ● SCADA Local Control System ● SCADA Systems – Main Properties ● SCADA Operation ● SCADA Systems – Basic Definitions ● SCADA System Features ● Levels of Hierarchy ● Field Level and Instrumentation Devices ● Scada Fieldbus Devices ● SCADA System for Pipelines ● Remote Terminal Units ● Communication Systems ● Master Stations ● Management Level ● SCADA Configuration ● Technology Innovation and Future Trends*
1145 - 1200	*Break*
1200 – 1300	***Introduction Safety Instrumented Systems (SIS)*** *Causes of Accidents ● What is a Safety Related System (SRS)? ● Customer and Safety ● Position of a Safety Instrumented System in a Total Control System ● Process Parameter Range ● Prime System Requirements ● Safety Loops ● What Standards do Safety Systems Need to Comply With? ● Applied Standards ● What is IEC 61508? ● Safety Related Systems (SRS) ● SIS – Logic Solver ● Quantitative Assessment ● Probabilities/Safety Integrity Level ● System Integrity ● Proof Test ● Proof Test Coverage ● De-energised to trip – DETT (ESD) ● Energised to trip – ETT (F&G) ● Redundancy for Sensors and Final Elements ● Safety Versus Costs ● Safety-PLC ● Rugged High Strength PLC Design Common Industrial Failure Mechanisms ● Extensive Diagnostics ● Approval Bodies ● Safety-PLC Common Cause Strength ● Safety-PLC : Diversity feature ● Standard Redundancy (1oo1D) ● Module-to-Module Redundancy ● Safety-PLC-PLC 1oo2D ● Rack-to-Rack Redundancy (1oo2D) ● Safety-PLC Redundancy ● Safety-PLC-PLC Basic Communication ● Data Access From Human System Interface ● Faceplate ● Design Concept ● Critical Control Module (CCM) ● All I/O Modules ● Critical Discrete Module (CDM) ● V-NET Connection ● Ladder Logic Diagrams*
1300 – 1420	***Safety Integrity Level*** *Introduction ● Safety Life Cycle Concept ● General ● SIL Categories ● Definition Safety Integrity Level ● Safety Integrity Level - Selection Procedure ● Safety Integrity Level - Analysis ● Risk considerations according to IEC 61508*
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

0730 – 0900	***Safety Instrumented Systems*** *Introduction ● Probability of Failure ● System Architecture ● Basic PLC System ● SIS – System Architecture ● Standard PLCs for Safety Applications? ● Characteristics of Safety PLCs ● Safety Instrumented Systems ● Redundancy for Sensors and Final Elements ● Typical Questions and Answers - SIS*
0900 - 0915	*Break*
0915 – 1015	***Instrument Maintenance Systems & Integrity*** *Technical Integrity Management ● Tasks of Instrument Technician ● Educational Requirements for I.T. ● Competence Requirements for Instrument Tech ● Preventive Maintenance Activities ● Preventive Maintenance – Documents ● Supervisory Responsibilities ● Definition Calibration ● Maintenance Logs Charts ● Maintenance Site Logs ● Instrument Maintenance ● Tools to improve Maintenance Efficiency ● Preventive Maintenance ● Maintenance Log Charts ● Key Performance Indicators (KPI) ● Example of Maintenance Log Chart ● Human Errors in Instrumentation ● Human Error Mitigation ● Dedicated Instrument Training ● Best Practices for Preventive Maintenance*
1015 – 1115	***Quality Factors Precision, Accuracy, Standard Deviation & Variance*** *Definition of Accuracy ● The Accuracy of Measurement Achieved is Mainly Influenced by Factors Like ● Measurement Definitions ● Other Issues Related to Measurement ● Accuracy, Precision, Standard Deviation & Variance ● STD, Precision, Repeatability and Reproducibility ● Population Density Function (PDF) ● Statistical Control ● Normal Distribution ● State of Statistical Control ● Bias and Offset ● Types of Errors ● Competence Requirements and Risk ● Measurement Outliers ● Determination of Outliers with Dixon's Q-test ● Limits Table for the Dixon's Q-test ● Example Dixon's Q-test ● Tools for Performance MonitoringControl Charts ● Decision Rules for Intervention ● Control Limits ● Practical Determination of the Control Limits ● Determination of the Validation frequency*
1115 - 1130	***Break***
1130 – 1300	***Flow-meter Proving Systems*** *Why Is Proving Performed? ● What Is the Outcome of Proving? ● Flow Calibration ● Capacitive Type Flowmeter (Courtesy Krohne) ● On–Site Flow Calibration ● On-site Calibration ● Flow Calibration at Line ● Flow Calibration at Line in Hazardous Area ● Flow Calibration Turbine Meters*
1300 – 1400	***Prover Systems*** *History ● Definitions ● Main Types ● Maintenance ● Problems ● Prover Systems Main Types ● Master Meter Prover System ● Operating principle ● Ball Prover Loop ● What are the fiscal metering functions? ● Flow Computer function ● Some general issues*
1400 – 1410	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1410 – 1420	***POST-TEST***
1420 – 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”, “Siemens SIMATIC Step 7”, “RSLogix 5000” and “Logix5555”.
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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

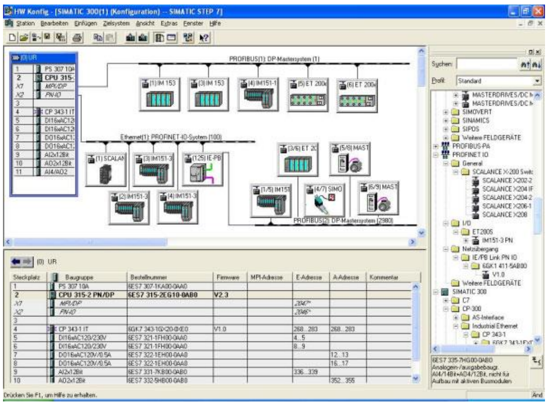
Siemens S7-1200 Simulator

Siemens S7-400 Simulator

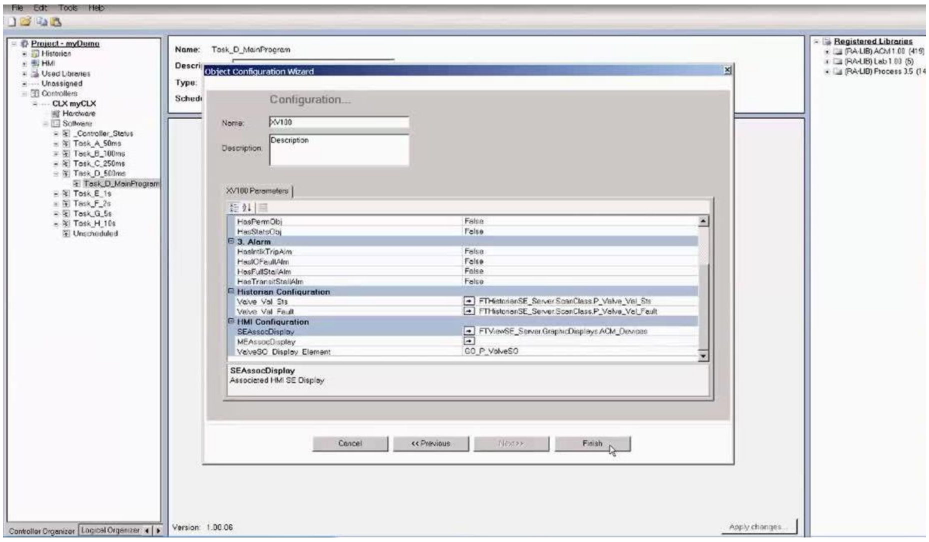
Siemens SIMATIC S7-300

Siemens S7-200 Simulator

Siemens S7-200 Simulator



Siemens SIMATIC Step 7 Professional Software



RSLogix 5000

Logix5555

Course Coordinator
Kamel Ghanem, Tel: +971 2 30 91 714, Email: kamel@haward.org