COURSE OVERVIEW IE0566
Instrumentation and Control Engineering, Control Theory, Rotating Equipment Controls and Operation Certification

Course Title
Instrumentation and Control Engineering, Control Theory, Rotating Equipment Controls and Operation Certification

Course Date/Venue
November 03-07, 2024/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
IE0566

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 instrumentation and control engineering, rotating equipment controls and operation. It covers pumps, blower, gas turbine and steam turbine; the reciprocating compressors and axial compressors; the elements of process control, signals, drawings and control loop operations; the PID and handling control loop interactions; the CCC-antisurge series 3+; the series 3 plus antisurge controller; and the prediction and tailored control response.

Further, the course will also discuss the surge or overload conditions, measurable variable and proportional-integral control for preventing reset windup; the performance and antisurge controllers tuning; the surge calculations; the destabilization prevention; the limit control and surge protection; the automatic start-up and shut-down logic; the transfer between manual and automatic operating modes; the operator error protection, modbus interface and operator interface module (OIM); and the preventive and predictive maintenance, speed and acceleration limiting and compressor and blowers discharge pressure limiting.

Course Objectives

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

- Apply and gain an in-depth knowledge on instrumentation and control engineering, control theory, rotating equipment controls and operation
- Operate rotating equipment that includes pumps, blower, gas turbine and steam turbine
- Discuss reciprocating compressors and axial compressors as well as the elements of process control, process control signals and drawings and process control loop operations
- Carryout PID and handling control loop interactions
- Illustrate CCC-antisurge series 3+ and discuss compressors and blowers and characteristic combination of maximum head and minimum flow
- Apply series 3 plus antisurge controller and determine how close the compressor is to surging
- Analyze surge prediction and tailored control response
- Explain surge or overload conditions, measurable variable and proportional-integral control for preventing reset windup
- Describe performance and antisurge controllers tuning, surge calculations automatically adapt to changing inlet conditions and open and closed-loop control responses
- Prevent destabilization and apply limit control and surge protection
- Employ automatic start-up and shut-down logic and illustrate transfer between manual and automatic operating modes
- Illustrate operator error protection, modbus interface and operator interface module (OIM)
- Employ preventive and predictive maintenance, speed and acceleration limiting and compressor and blowers discharge pressure limiting

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 instrumentation and control engineering, rotating equipment controls and operation for instrument engineers, supervisors and technicians.

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 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 Middle East

Continuing Professional Development (HTME-CPD)

CEU Official Transcript of Records

TOR Issuance Date: 14-Nov-21

HTME No. 3558-6717-5364-9527

Participant Name: Abdulsatar Al Otaibi

Program Ref.	Program Title	Program Date	No. of Contact Hours	CEU's
IE0566	Instrumentation and Control Engineering, Control Theory, Rotating Equipment Controls and Operation Certification	10 Nov-14 Nov, 2021	32.5	3.25

Total No. of CEU's Earned as of TOR Issuance Date **3.25**

TRUE COPY

Maricel De Guzman
Academic Director

Haward Technology has been approved as an Authorized 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 1-2013 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 1-2013 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 | Fax: +971 2 3091 716 | E-mail: info@haward.org | Website: www.haward.org

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. Ahmed El-Sayed, PhD, MSc, BSc, is a **Senior Electrical & Instrumentation Engineer** with **35 years** of extensive experience within the **Oil**, **Gas**, **Power**, **Petroleum**, **Petrochemical** and **Utilities** industries. His experience widely covers in the areas of Advanced Distributed Control System (**DCS**), **DCS** Operation & Configuration, **DCS** Troubleshooting, **DCS Yokogawa** ProSafe-RS Safety Instrumented System, **DCS Yokogawa** Centum VP, **DCS Emerson** DeltaV, **DCS GE Mark VI**, Programable Logic Controller (**PLC**), Supervisory Control & Data Acquisition (**SCADA**) Systems, Siemens **PLC Simatic S7-400/S7-300/S7-200**, **Siemens SIMATIC S7** Maintenance & Configuration, **Siemens WINCC**, SCADA System: Siemens **SIMATIC & WinCC**, **Process Control**, **Control Systems & Data Communications**, **Instrumentation**, **Automation**, **Valve Tuning**, Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), **Telemetry** Systems, **Boiler Control & Instrumentation**, Advanced Process Control (**APC**) Technology, Practical **Fiber-Optics** Technology, **Compressor** Control & Protection, **GE Gas Turbines**, **Alarm** Management Systems, **Engine** Management System, **Fieldbus** Systems, **NEC** (National Electrical Code), **NESC** (National Electrical Safety Code), **Electrical Safety**, **Electrical Hazards** Assessment, **Electrical Equipment**, Electrical Transient Analysis Program (**ETAP**), Power **Quality**, Power **Network**, Power **Distribution**, **Distribution Systems**, **Power Systems Control**, **Power Systems Security**, Power **Electronics**, **Power System** Harmonics, **Power System** Planning, Control & Stability, **Power Flow** Analysis, **Smart Grid & Renewable** Integration, **Power System Protection & Relaying**, Economic Dispatch & Grid Stability Constraints in Power Plants, Electrical Demand Side Management (DSM), Electrical **Substations**, **Substation Automation** Systems & Application (IEC 61850), **Distribution Network** System Design, **Distribution Network Load**, Electrical **Distribution** Systems, **Load Forecasting** & System Upgrade (Distribution), **Overhead Power Line** Maintenance & Patrolling, High Voltage **Switching** Operations, Industrial **UPS Systems & Battery** Power Supplies, Electric **Motors & Variable Speed Drives**, **Generator** Maintenance & Troubleshooting, **Generator** Excitation Systems & AVR, **Transformer** Maintenance & Testing, Lock-Out & Tag-Out (**LOTO**), Confined Workspaces and **Earthing & Grounding**, He is currently the **Systems Control Manager** of **Siemens** where he is in-charge of Security & Control of Power **Transmission Distribution** & **High Voltage** Systems and he further takes part in the Load Records Evaluation & Transmission Services Pricing.

During his career life, Dr. Ahmed has been actively involved in different Power System Activities including Roles in Power System Planning, Analysis, Engineering, **HV Substation** Design, Electrical Service Pricing, Evaluations & Tariffs, Project Management, Teaching and Consulting. His vast industrial experience was honed greatly when he joined many International and National Companies such as **Siemens**, **Electricity Authority**, Egyptian Electricity Holding, Egyptian Refining Company (ERC), **GASCO**, Tahrir Petrochemicals Project, and **ACETO** industries as the **Instrumentation & Electrical Service Project Manager**, **Energy Management Engineer**, **Department Head**, **Assistant Professor**, **Project Coordinator**, **Project Assistant and Managing Board Member** where he focused more on dealing with Technology Transfer, System Integration Process and Improving Localization. He was further greatly involved in manufacturing some of **Power System** and **Control & Instrumentation Components** such as Series of Digital Protection **Relays**, MV **VFD**, **PLC** and **SCADA** System with intelligent features.

Dr. Ahmed has **PhD**, **Master's** & **Bachelor's** degree in **Electrical Engineering** from the **University of Wisconsin Madison**, **USA** and **Ain Shams University**, respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/ Assessor/Trainer** by the **Institute of Leadership and Management** (**ILM**), an active member of IEEE and ISA as well as numerous technical and scientific papers published internationally in the areas of Power Quality, Superconductive Magnetic Energy Storage, SMES role in Power Systems, Power System **Blackout** Analysis, and Intelligent Load Shedding Techniques for preventing Power System Blackouts, HV **Substation Automation** and Power System Stability.

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.

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, 03rd of November 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0900	***Rotating Equipment Operation*** *Pumps Types & Principles of Operation ● Blower Principle of Operation ● Gas Turbine Principle of Operation ● Steam Turbine Principle of Operation*
0900 – 0915	*Break*
0915 – 1000	***Compressors & Blowers*** *Compressors Principles of Operation ● Reciprocating Compressors ● Axial Compressors ● Compressors Operating Map ● Compressors Operating Point ● Compressors Speed Curves ● Compressors Performance Limits ● Compressors Surge Phenomenon ● Compressors Protection Methods*
1000 – 1100	***Introduction to Process Control*** *Elements of Process Control ● Process Control Signals ● Process Control Drawings ● Using Symbols and Diagrams in Process Control ● Process Control Loop Operations*
1100 – 1200	***PID & Handling Control Loop Interactions***
1200 – 1215	*Break*
1215 – 1420	***CCC - Antisurge Series 3+***
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2:	Monday, 04th of November 2024
0730 – 0900	***Compressors & Blowers Characteristic Combination of Maximum Head & Minimum Flow***
0900 – 0915	*Break*
0915 – 1030	***Series 3 Plus Antisurge Controller***
1030 – 1100	***Determination: How Close the Compressor is to Surging***
1100 – 1200	***Surge Prediction & Tailored Control Response***
1200 – 1215	*Break*
1215 – 1420	***Surge or Overload Conditions***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3:	Tuesday, 05th of November 2024
0730 – 0900	***Measurable Variable*** *Compression Ratio ● Pressure Drop Across a Flow Meter ● Gas Composition ● Suction Temperature & Pressure ● Rotational Speed & Guide Vane Angle*
0900 – 0915	*Break*
0915 – 1030	***Energy-Wasting Margin of Safety***
1030 – 1100	***Proportional-Integral Control for Preventing Reset Windup***
1100 – 1200	***Performance & Antisurge Controllers Tuning***
1200 – 1215	*Break*
1215 – 1420	***Surge Calculations Automatically Adapt to Changing Inlet Conditions***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4:	Wednesday, 06th of November 2024
0730 – 0900	***Open & Closed-Loop Control Responses***
0900 – 0915	*Break*
0915 – 1030	***Destabilizing Preventation***
1030 – 1100	***Limiting Control & Surge Protection***
1100 – 1200	***Automatic Start-Up & Shut-Down Logic***
1200 – 1215	*Break*
1215 – 1420	***Transfer Between Manual & Automatic Operating Modes***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5:	Thursday, 07th of November 2024
0730 – 0800	***Operator Error Protection***
0800 - 0900	***Modbus Interface***
0900 – 0915	*Break*
0915 – 1030	***Operator Interface Module (OIM)***
1030 – 1100	***Preventive & Predictive Maintenance***
1100 – 1130	***Speed & Acceleration Limiting***
1200 – 1215	*Break*
1215 – 1300	***Compressor & Blowers Discharge Pressure Limiting***
1300 – 1315	***Course Conclusion***
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" and "Automation Simulator".

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

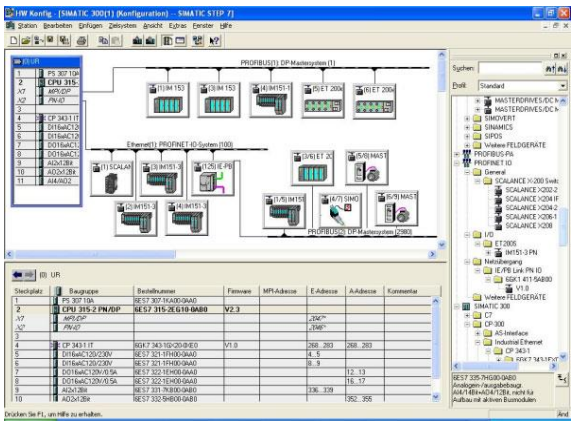
Siemens S7-1200 Simulator

Siemens S7-400 Simulator

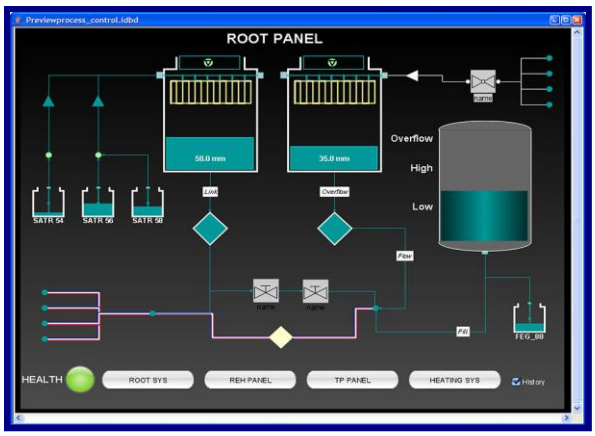
Siemens SIMATIC S7-300

Siemens S7-200 Simulator

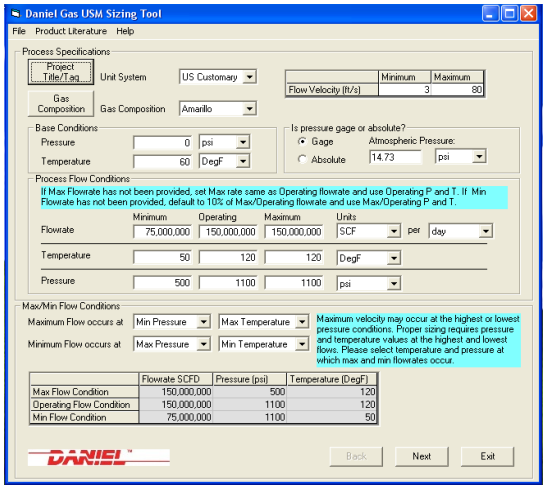
GE Fanuc Series 90-30 PLC Simulator



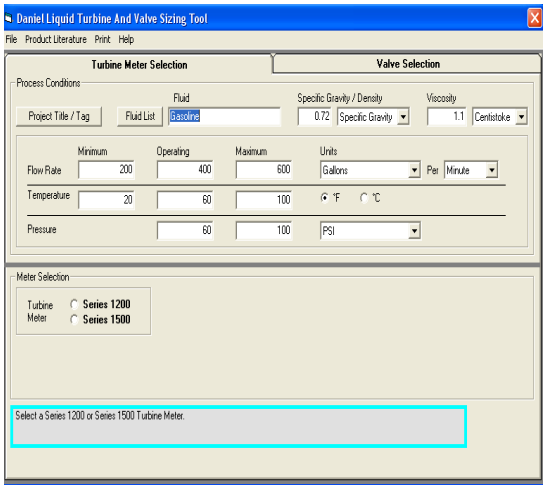
Siemens SIMATIC Step 7 Professional Software



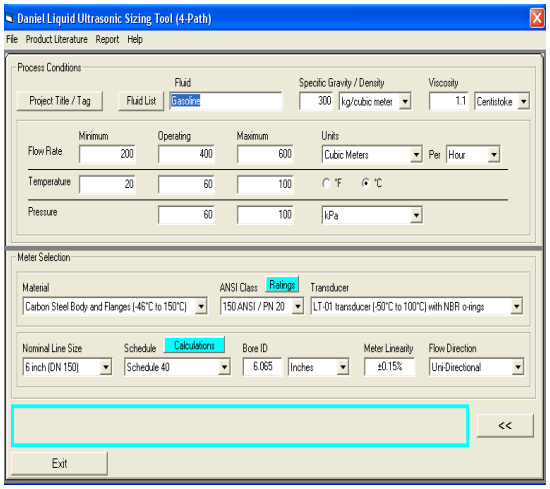
HMI SCADA



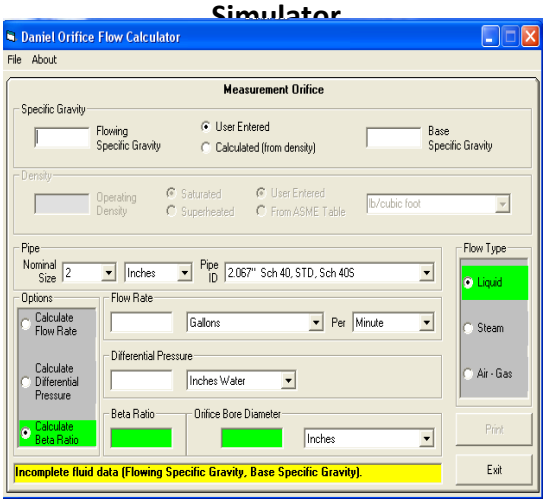
Gas Ultrasonic Meter (USM) Sizing Tool Simulator



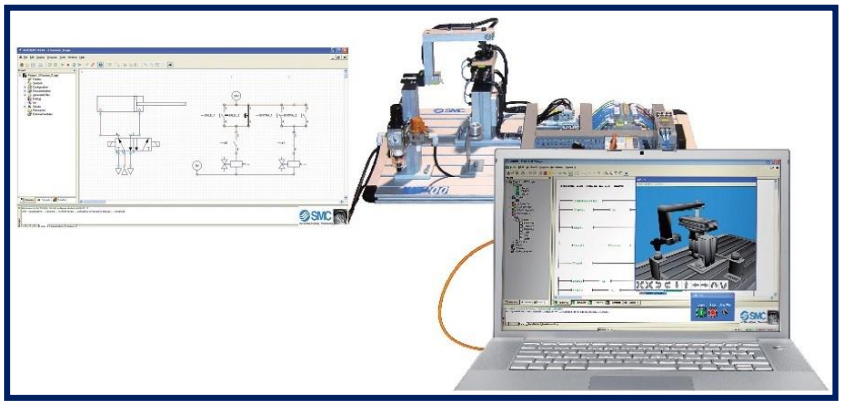
Liquid Turbine Meter and Control Valve Sizing Tool Simulator



Liquid Ultrasonic Meter Sizing Tool Simulator



Orifice Flow Calculator Simulator



AutoSIM – 200 Automation Simulator

Course Coordinator

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