



COURSE OVERVIEW ME0160

Modern Heating, Ventilation, Air-Conditioning (HVAC) & Refrigeration Systems: Design, Installation, Maintenance & Troubleshooting

Course Title

Modern Heating, Ventilation, Air-Conditioning (HVAC) & Refrigeration Systems: *Design, Installation, Maintenance & Troubleshooting*

Course Date/Venue

Session 1: March 29-April 02, 2025/Crowne Meeting Room, Crowne Plaza Al Khobar, KSA

Session 2: August 16-20, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai UAE



Course Reference

ME0160



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 in the class will be applied using the following practical methods:

(1) Industrial Facility Visit: Course participants will be taken to an industrial facility where they will practice testing, maintenance and troubleshooting. In case that this course is organized inside client premises (In-House), then client shall provide access to its HVAC and refrigeration workshop for practical sessions.



(2) HVAC Simulator: Participants will use in the class the state-of-the-art HVAC Simulator to practice some of the skills learnt.



The course is designed for engineers and other technical staff from a wide range of abilities and backgrounds. It will provide the participants with a complete and up-to-date overview of the area of heating, ventilation, air-conditioning (HVAC) and refrigeration. It commences with a review of psychrometric charts and then examines the factors that influence design choices, indoor air quality, load calculations and heating/ventilation and airconditioning systems. Numerous tips and tricks throughout the course make it very practical and topical to your applications.





Course Objectives

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

- Design, install, maintain and troubleshoot HVAC and refrigeration systems
- Recognize and apply the psychrometric chart
- Design for good air quality
- Perform basic load calculations
- Initiate an effective inspection and maintenance program
- Minimize forced outages and prevent serious damage to HVAC equipment
- Provide an overview of the legislative requirements plus the essential steps and responsibilities for the maintenance and repair of HVAC Systems
- Employ technologies available for the efficient energy management using HVAC 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 conveniently saved in a **Tablet PC**.

Who Should Attend

This course provides a complete and up-to-date overview of HVAC & refrigeration systems for HVAC, utilities, maintenance, plant, operation and inspection engineers and other technical staff who are involved in the design, installation, maintenance and troubleshooting of such equipment and system. Further, it is suitable for mechanical, design, electrical and consulting engineers.

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 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:-

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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.

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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.

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:



Mr. Manuel Dalas, MSc, BSc, is a Senior Mechanical & Maintenance Engineer with over 25 years of industrial experience in Oil, Gas, Refinery, Petrochemical, Power and Nuclear industries. His wide expertise includes Root Cause Failure Analysis, Rotating Equipment Maintenance & Failure Analysis, Failure Analysis Methodologies for Mechanical Engineers, Reliability Centered Maintenance & Root Cause Failure Analysis, Machinery Failure Analysis, Prevention & Troubleshooting, Machinery Failure Analysis, Machinery Root Cause Failure Analysis (RCFA), Machinery Diagnostics & Root Cause Failure Analysis, Water Well, Transfer & Network Systems Operation, Water Network Systems & Pumping Stations, Instrument, Control & Protection Systems, Plumbing Network Systems & Building, Water Distribution & Pump Station, Boiler Operation & Water Treatment, Pipeline Simulations, Pipe Stress Analysis using CAESAR II, CAESAR II Application, Piping Dynamic, Static & Other Special Analysis using CAESAR II, Expansion Joints Design & Analysis, Impact Load Analysis, Piping Systems, Piping Codes Used in CAESAR II, RFP Pipe Maintenance & Repair, Relief Valve Analysis, Safety Relief Valve, Tanks & Tank Farms, Atmospheric Tanks, Seismic Loads, Tank Shell, Tank Failure, Vacuum Tanks, Tank Design & Engineering, Tank Contractions, Material Cataloguing, Maintenance Planning & Scheduling, Reliability Centered Maintenance (RCM), Reliability Maintenance, Condition Based Maintenance & Condition Monitoring, Asset & Risk Management, Vibration Condition Monitoring & Diagnostics of Machines, Vibration & Predictive Maintenance, Reliability Improvement & Vibration Analysis for Rotating Machinery, Effective Maintenance Shutdown & Turnaround Management, Engineering Codes & Standards, Rotating Equipment Maintenance, Mechanical Troubleshooting, Static Mechanical Equipment Maintenance, Plant Reliability & Maintenance Strategies, Centrifugal Pumps Maintenance & Troubleshooting, Fans, Blowers & Compressors, Process Control Valves, Piping Systems & Process Equipment, Gas Turbines & Compressors Troubleshooting, Advanced Valve Technology, Pressure Vessel Design & Analysis, Steam & Gas Turbine, High Pressure Boiler Operation, FRP Pipe Maintenance & Repair, Centrifugal & Positive Displacement Pump Technology Troubleshooting & Maintenance, Rotating Machinery Best Practices, Diesel Engine Operations, Maintenance & Troubleshooting, PD Compressor & Gas Engine Operation & Troubleshooting, Hydraulic Tools & Fitting, Mass & Material Balance Tank Farm & Tank Terminal Safety & Integrity Management, Process Piping Design, Construction & Mechanical Integrity, Stack & Noise Monitoring, HVAC & Refrigeration Systems, BPV Code, Section VIII, Division 2, Facility Planning & Energy Management, Hoist - Remote & Basic Rigging & Slings, Mobile Equipment Operation & Inspection, Heat Exchanger, Safety Relief Valve, PRV & POPRV/PORV, Bearing & Lubrication, Voith Coupling Overhaul, Pump & Valve Technology, Lubrication Inspection, Process Plant Optimization, Rehabilitation, Revamping & Debottlenecking, Engineering Problem Solving and Process Plant Performance & Efficiency. Currently, he is the Technical Consultant of the Association of Local Authorities of Greater Thessaloniki where he is in charge of the mechanical engineering services for piping, pressure vessels fabrications and ironwork.

During his career life, Mr. Dalas has gained his practical and field experience through his various significant positions and dedication as the **Technical Manager, Project Engineer, Safety Engineer, Deputy Officer, Instructor, Construction Manager, Construction Engineer, Consultant Engineer, Water Network Systems Engineer, Maintenance Engineer and Mechanical Engineer and CAESAR II Application Consultant** for numerous multi-billion companies including the **Biological Recycling Unit and the Department of Supplies of Greece, Alpha Bank Group, EMKE S.A, ASTE LLC and Polytechnic College of Evosmos.**

Mr. Dalas has a **Master's degree in Energy System** from the **International Hellenic University, School of Science & Technology** and a **Bachelor's degree in Mechanical Engineering** from the **Mechanical Engineering Technical University of Greece** along with a **Diploma in Management & Production Engineering** from the **Technical University of Crete**. Further, he is a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership and Management (ILM)**, a **Certified Project Manager Professional (PMI-PMP)**, a **Certified Instructor/Trainer**, a **Certified Energy Auditor for Buildings, Heating & Climate Systems**, a **Member of the Hellenic Valuation Institute and the Association of Greek Valuers** and a **Licensed Expert Valuer Consultant** of the **Ministry of Development and Competitiveness**. He has further delivered numerous trainings, courses, seminars, conferences and workshops internationally.





Course Program

The following program is planned for this course. However, the course instructors) 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 – 0915	Introduction Introduction to HVAC Basics • HVAC Abbreviations • HVAC Codes and Standards • HVAC Definitions • Air Conditioning • Ventilation • Refrigeration • HVAC Overview
0915 – 0930	Break
0930 – 1030	Basic Principals of HVAC Air Properties • Dry Bulb Temperature • Wet Bulb Temperature • Dew Point • Humidity Ratio • Relative Humidity • Psychrometric Chart Definition • Properties of Psychrometry • Psychrometric Chart • Psychrometric Chart Application
1030 – 1115	Principles of Heat Transfer Heat Transfer • Method of Heat Transfer • Sensible and Latent Heat • Sensible Heat Definition • Latent Heat Definition • First Law of Thermodynamic
1115 – 1215	Design Conditions Outdoor Climate • Indoor Comfort • Solar Orientation • Indoor Air Quality
1215 – 1230	Break
1230 – 1330	Air Purification Methods & Air Motion Comfortable Velocity Ranges • Heat Gain From Occupants
1330 – 1420	Moisture Removal, Design Conditions
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 – 0830	HVAC Design Criteria Load Calculations • Load Components • Sensible Load • Latent Load • Load Categories • Skin Load • Internal Loads • People Load • Light Load • Equipment Load
0830 – 0945	Room Load Effective Load • Other Loads (Return Air Side Load –Supply Air Side Load) • Other Loads (Ventilation Load) • Grand Load • Refrigeration Load • Summer Air Conditioning System with Return Air (for Example)
0945 – 1000	Break
1000 – 1100	Air Conditioning (Equipment- Systems) Case Study: Manual Calculations • Design Calculations for Super Market in Egypt – Alexandria City • Load Calculations System • Manual Calculations • Room Load Calculations • Transmission Load • Sun Load Calculation • Persons Load • Light Load • Equipment Load



1100 – 1200	Total Room Load Plot Design Conditions on Psychrometric Chart • Sensible Heat Factor • Ventilation (Outside Air Load) Sensible Load Calculation • Ventilation Latent Load Calculation • Coil Load Calculation • Mixing Point • Supply Point • Apparatus Dew Point
1200 – 1215	Break
1215 – 1330	Duct Design Duct Design Methods • Equal Friction Method • Using Ductlator • Duct Sizer Software • Duct Design Procedures • Duct Types • Diffusers –Grills • Duct Accessories – Case Study • Cooling System Selection
1330 – 1420	Duct Insulation Material Selection & Sizing
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	KOTZA System Data Input • Output Report
0830 – 0945	Practical Calculations Case Study • Gymnasium in USA Data Input
0945 – 1000	Break
1000 – 1100	Refrigeration Definition • Systems • Types • Components • P-H Chart • Calculations • Superheat Degrees • Sub-Cooling Degrees • Refrigerants • COP Calculations • EER Calculations
1100 – 1215	Refrigeration (cont'd) Water System Calculations • Case Study • Ton of Refrigeration
1215 – 1230	Break
1230 – 1330	Chillers Chiller Components • Types of Compressors • Reciprocating Compressor • Screw Compressor • Scroll Compressor • Centrifugal Compressor
1330 – 1420	Chillers (cont'd) Air Cooled Condensers • Water Cooled Condensers • Evaporative Condensers
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 – 0830	Comparison Between Air Cooled & Water Cooled Condensers
0830 – 0945	Flooded Evaporators – DX Evaporators
0945 – 1000	Break
1000 – 1100	Absorption Refrigeration Cycle Expansion Devices • Pressure Gages • Test Manifolds • Recovery Units
1100 – 1215	Testing – Maintenance Purging • Pump Down • Leak Test • Adding Oil
1215 – 1230	Break



1230 – 1330	Testing – Maintenance (cont’d) Commissioning
1330 – 1420	Maintenance Definition • Objectives • Goals • Equipment Life Cycle
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Four

Day 5

0730 – 0845	Maintenance (cont’d) Types of Maintenance • Chiller Maintenance
0845 – 0915	Fault Finding Objectives • Introduction • Faults
0915 – 0930	Break
0930 – 1100	Troubleshooting Skills Troubleshooting Tools • Technical Equipment
1100 – 1215	Troubleshooting Procedures Equipment Failure
1215 – 1230	Break
1230 – 1300	Troubleshooting Analysis
1300 – 1345	Maintenance Case Studies
1345 – 1400	Course Conclusion
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

Practical Sessions/Site Visit

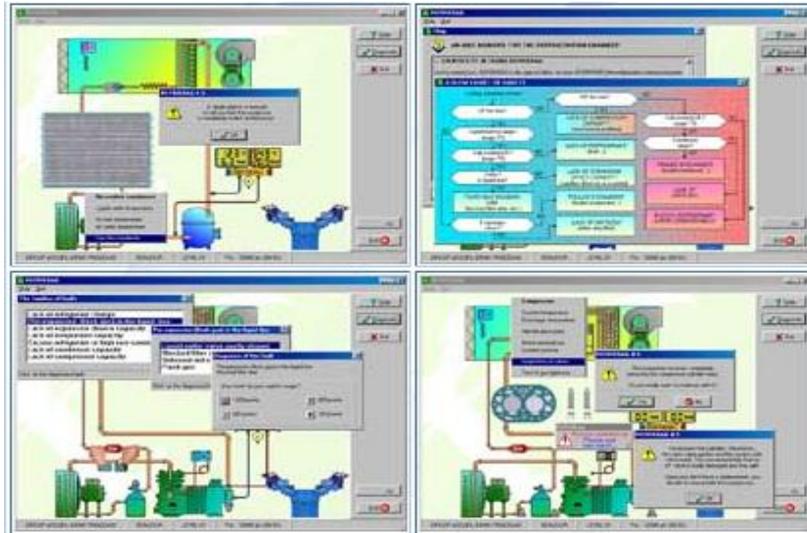
Site visit will be organized during the course for delegates to practice the theory learnt:-



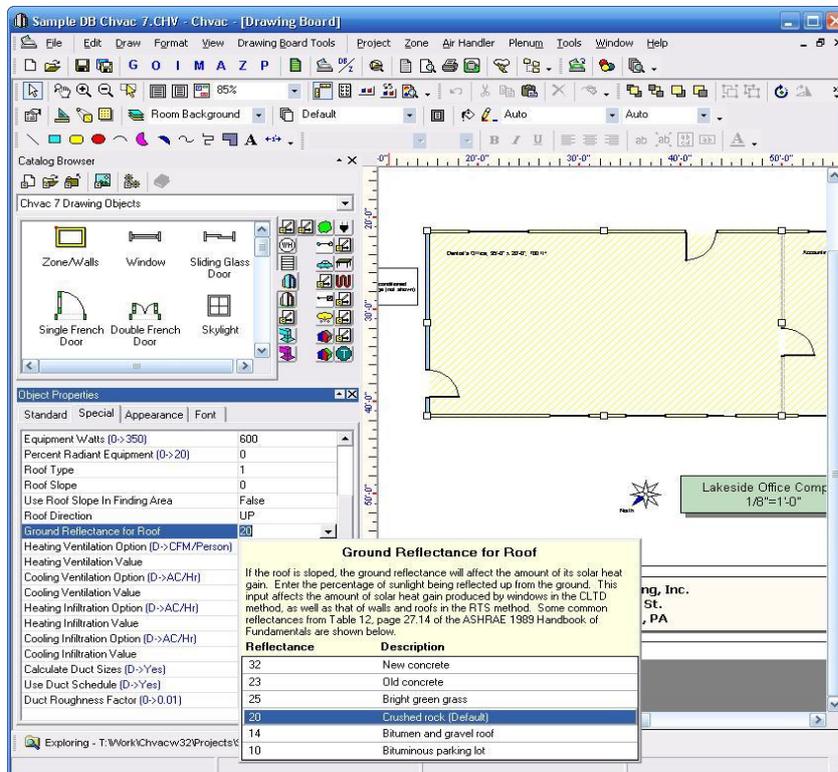


Simulators (Hands-on Practical Sessions)

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 “Elite CHVAC Simulator”, “KOTZA HVAC Simulator”, “Danfoss Refrigerant Slider App”, “Danfoss Trouble Shooter App” and “Air Lite Psychrometric Calcs”.



KOTZA HVAC Simulator



Elite CHVAC Simulator



<p><u>Danfoss Refrigerant Slider App</u></p>	<p><u>Danfoss Trouble Shooter App</u></p>	<p><u>Air Lite Psychrometric Calcs</u></p>

Course Coordinator

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