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: February 16-20, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: August 17-21, 2025/Al Khobar Meeting Room, Hilton Garden Inn, Al Khobar, KSA

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 psychrometic 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 psychrometic 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:-

- 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:

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 BalanceTank Farm & Tank Termina**l 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 & Slinging**, **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

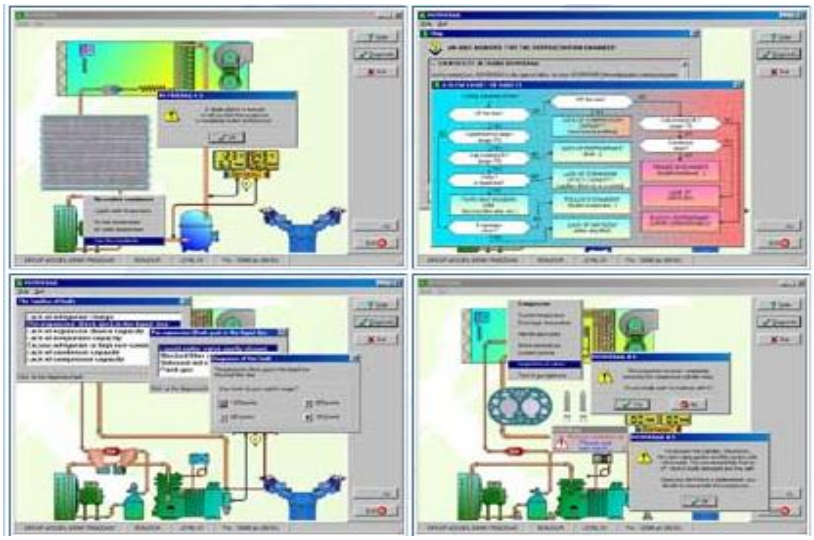
Site visit will be organized during the course for delegates to practice the theory learnt:-



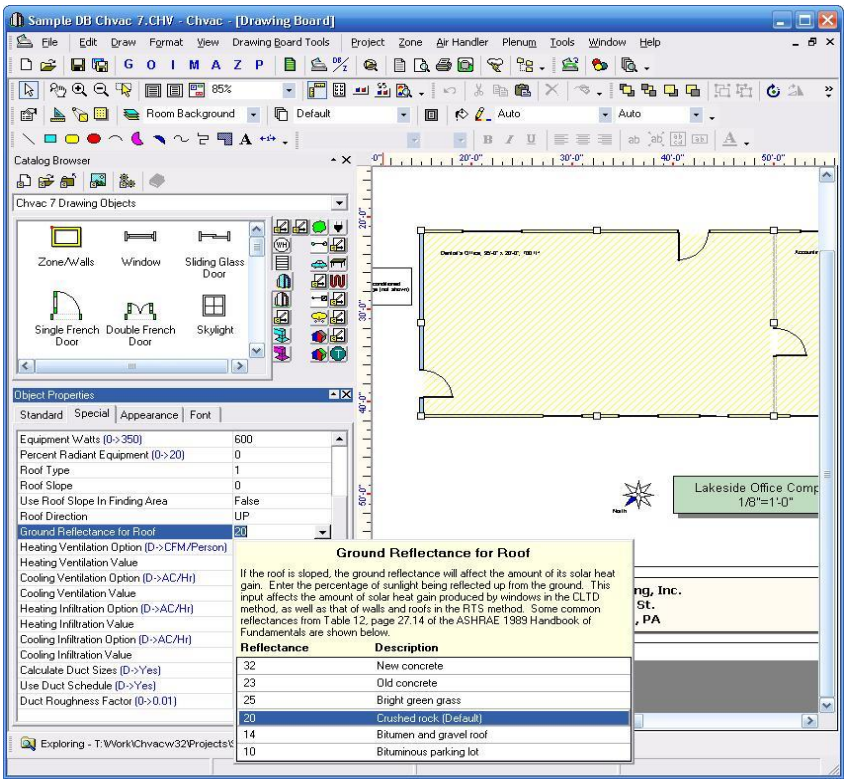



Simulators (Hands-on Practical Sessions)

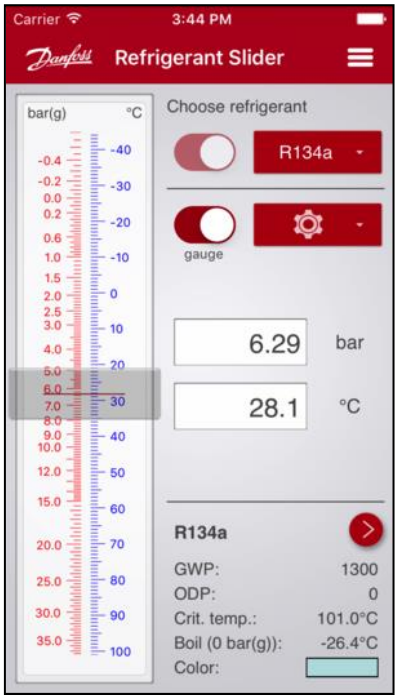
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using one of our state-of-the-art simulators “Elite CHVAC Simulator”, “KOTZA HVAC Simulator”, “Danfoss Refrigerant Slider App”, “Danfoss Trouble Shooter App” and “Air Lite Psychrometric Calcs”.



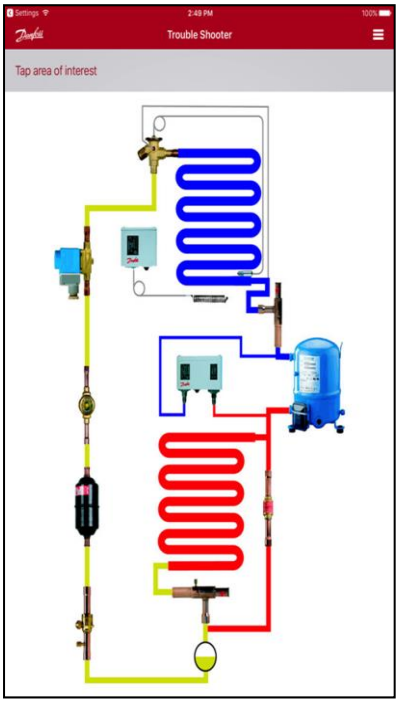
KOTZA HVAC Simulator



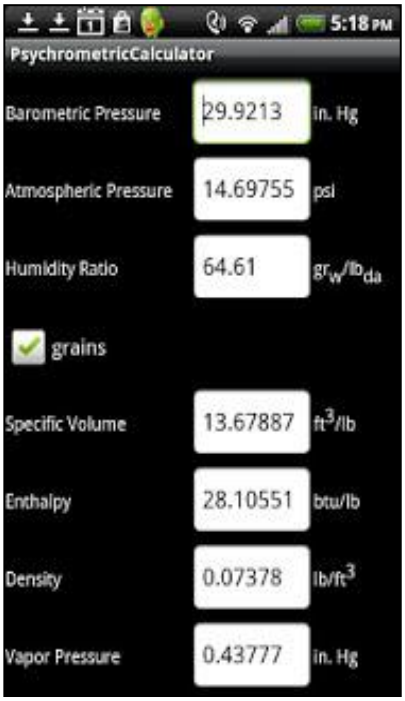
Elite CHVAC Simulator



Danfoss Refrigerant Slider App



Danfoss Trouble Shooter App



Air Lite Psychrometric Calcs

Course Coordinator

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