OURSE OVERVIEW ME0160-4D

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

October 14-17, 2024/Executive Club Lounge Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference

ME0160-4D

Course Duration/Credits

Four days/2.4 CEUs/24 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, 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 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$ 4,500 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 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 **2.4 CEUs** (Continuing Education Units) or **24 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. Mustafa Fadel is a **Senior Mechanical Engineer** with over **25 years** of industrial experience within the **Power & Water Utilities** and other **Energy Sectors**. His specialization widely covers **District Cooling**: **Plant**: **Design**, **Operation & Maintenance HVAC System**, **HVAC** Equipment Terminology, **HVAC System Block Load Calculation**, **HVAC System** Development of Drawings, **Air Distribution** System, Basic **Chiller Water System Design & Selection**, **Pump** Design & Selection, **Rotating & Static Equipment**, **Cooling Tower Design**, **Boiler** Design & Selection, Energy Management & Value Engineering for Mechanical System, Mechanical Ventilation, Smoke Ventilation, Staircase Pressurization, System Design & Development of Drawings, Data Center Design, **Precision AC Equipment Selection**, **Refrigeration Systems**, **Air Cooler Design**, **Chillers**, **Mass** & **Heat Transfer**, **Electromechanical**, **Rotating & Static Equipment** including **Heat Exchangers**, **Piping & Pipeline**, **Pressure Vessels**, **Valves**, **Tanks Turbines**, **Compressors**, **Motors**, **Pumps**, **Evaporators**, **Condensers**, **Blowers** and **Fans**, **Maintenance Planning & Scheduling**, **Root Cause Failure Analysis**, **Performance Calculations**, **Reliability Maintenance** and **Corrective** & **Preventive Maintenance**. Further, he is also well-versed in **HSE Management**, **KPI's**, **CMMS** and **AutoCAD** as well as in various international standards such as the **ASHRAE**, **API**, **ASTM**, **ASME**, **AMCA**, **NFPA** and **SMACNA**. Currently, he is the **HVAC&R Specialist** in **SEGAS LNG Plant** wherein he is responsible for the implementation, construction and maintenance strategy for industrial HVAC&R equipment.

During his career life, Mr. Fadel has gained his practical and field experience through his various significant positions and dedication as the **Section Head**, **Project Manager**, **HVAC System Consultant Engineer**, **Mechanical Engineer**, **HVAC&R Instructor** and **Senior Technical Consultant** for international companies and universities like the **Foster Wheeler**, **Technip**-Italy, Borner Company, Union FENOSA Gas, Asphalt Bitumen, King Khalid University, Alexandria Petroleum Company, FAWAZ Company, Marium Corporation and many more.

Mr. Fadel has a **Bachelor's** degree in **Power Mechanical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and an active member of the American Society of Heating Refrigetaring and Air Conditioning Engineers (**ASHRAE**), **USA**. He has further delivered and participated numerous engineering and inspection projects, trainings, courses, seminars and conferences globally.

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: ***Monday, 14th of October 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0915	***Introduction*** *Introduction to HVAC Basics ● HVAC&R Abbreviations ● HVAC Codes and Standards ● HVAC&R Definitions ● Air Conditioning ● Ventilation ● Refrigeration ● HVAC&R Overview*
0915 – 0930	*Break*
0930 – 1030	***Basic Principals of HVAC&R*** *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 and 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: ***Tuesday, 15th of October 2024***

0730 – 0815	***HVAC Design Criteria*** *Load Calculations ● Load Components ● Sensible Load ● Latent Load ● Load Categories ● Skin Load ● Internal Loads ● People Load ● Light Load ● Equipment Load*
0815 – 0900	***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)*
0900 – 0945	***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*
0945 – 1000	*Break*

1000 – 1100	***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*
1100 – 1200	***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*
1200 – 1215	*Break*
1215 – 1330	***Duct Insulation Material Selection & Sizing***
1330 – 1420	***Hourly Analysis Program (HAP)*** *System Data Input ● Output Report*
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: ***Wednesday, 16th of October 2024***

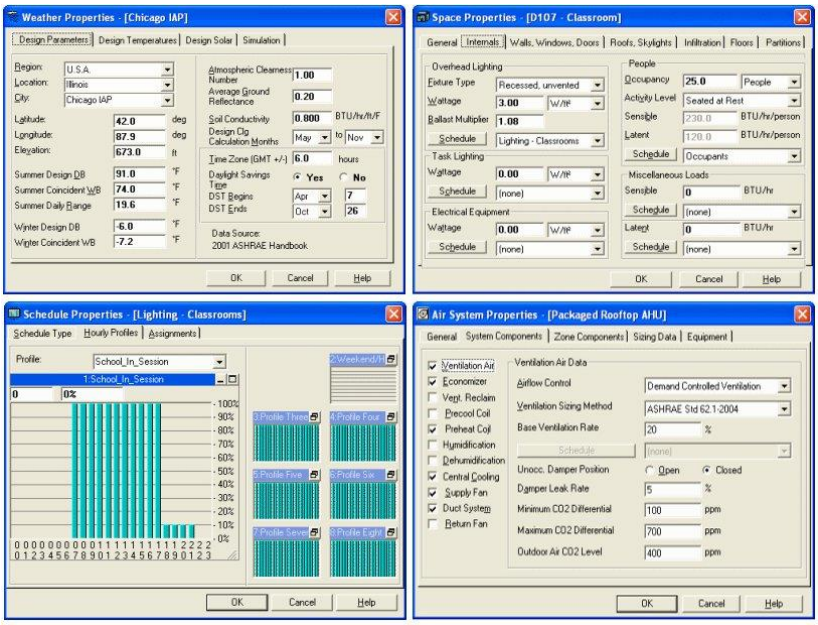
0730 – 0815	***Practical Calculations*** *Case Study ● Gymnasium in USA Data Input*
0815 – 0900	***Refrigeration*** *Definition ● Systems ● Types ● Components ● P-H Chart ● Calculations ● Superheat Degrees ● Sub-Cooling Degrees ● Refrigerants ● COP Calculations ● EER Calculations ● Water System Calculations ● Case Study ● Ton of Refrigeration*
0900 – 0945	***Chillers*** *Chiller Components ● Types of Compressors ● Reciprocating Compressor ● Screw Compressor ● Scroll Compressor ● Centrifugal Compressor ● Air Cooled Condensers ● Water Cooled Condensers ● Evaporative Condensers*
0945 – 1000	*Break*
1000 – 1100	***Comparison Between Air Cooled and Water Cooled Condensers***
1100 – 1215	***Flooded Evaporators – DX Evaporators***
1215 – 1230	*Break*
1230 – 1330	***Absorption Refrigeration Cycle*** *Expansion Devices ● Pressure Gages ● Test Manifolds ● Recovery Units*
1330 – 1420	***Testing – Maintenance*** *Purging ● Pump Down ● Leak Test ● Adding Oil ● Commissioning*
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: ***Thursday, 17th of October 2024***

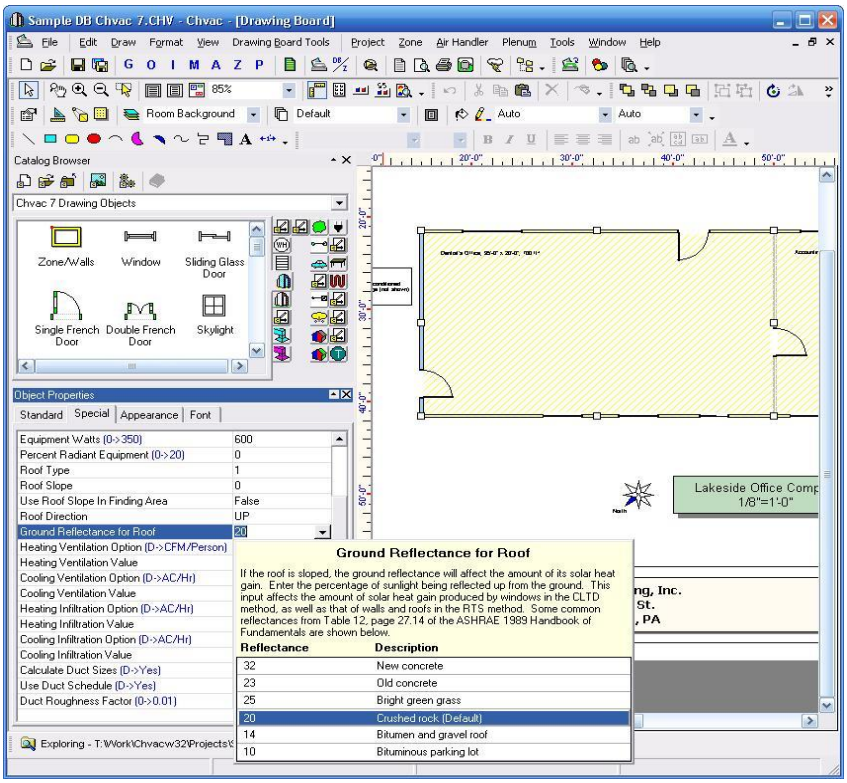
0730 – 0815	***Maintenance*** *Definition ● Objectives ● Goals ● Equipment Life Cycle ● Types of Maintenance ● Chiller Maintenance*
0815 – 0900	***Fault Finding*** *Objectives ● Introduction ● Faults*
0900 – 0945	***Troubleshooting Skills*** *Troubleshooting Tools ● Technical Equipment*
0945 – 1000	*Break*
1000 – 1100	***Troubleshooting Procedures*** *Equipment Failure*
1100 – 1215	***Troubleshooting Analysis***
1215 – 1230	*Break*
1230 – 1345	***Maintenance Case Studies***
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*

Practical Sessions/Site Visit

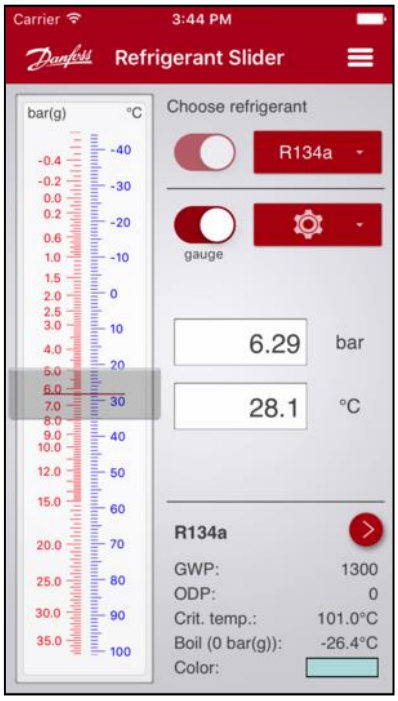
Simulator (Hands-on Practical Sessions)



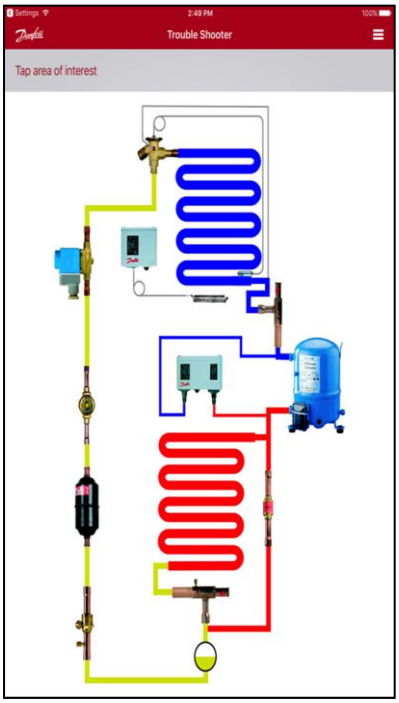
Hourly Analysis Program (HAP) Software



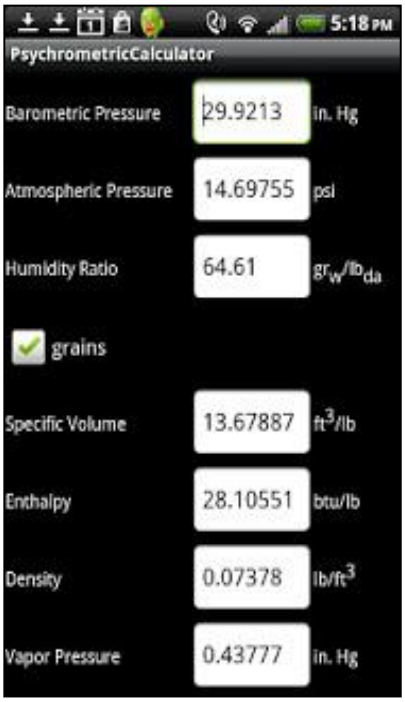
Elite HVAC Simulator



Danfoss Refrigerant Slider App



Danfoss Trouble Shooter App



Air Lite Psychrometric Calcs

Course Coordinator

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