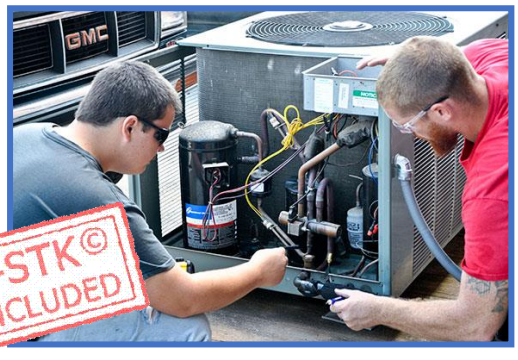
COURSE OVERVIEW ME0384
HVAC Systems

Course Title
HVAC Systems

Course Reference
ME0384

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs



Course Date/Venue

Session(s)	Date	Venue
1	September 08-12, 2024	Boardroom, Warwick Hotel Doha, Doha, Qatar
2	November 24-28, 2024	

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.

(**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.

This course is designed to provide participants with a detailed and up-to-date overview of HVAC Systems. It covers the importance and components of an HVAC system; the basic principles of heat transfer and thermodynamics; the heating systems, cooling systems, ventilation systems and air distribution systems; the HVAC system controls, control strategies, building automation systems (BAS) and energy management and optimization; the energy efficiency measures for HVAC systems, energy-saving technologies, HVAC system maintenance and optimization and green building standards and certifications; and the factors affecting indoor air quality, pollutant sources and their health effects and air filtration and purification systems.

During this interactive course, participants will learn the importance of indoor air quality through ventilation strategies and load calculation and system sizing; the HVAC system installation best practices, commissioning process, testing and balancing procedures and start-up and performance verification; the preventive maintenance tasks for HVAC systems, troubleshooting, safety precautions during maintenance and repairs and documentation and record-keeping; the hydronic systems and types of air conditioning systems; and the ductwork design and installation.

Course Objectives

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

- Apply and gain an in-depth knowledge on HVAC systems
- Discuss the importance and components of an HVAC system including the basic principles of heat transfer and thermodynamics
- Recognize the heating systems, cooling systems, ventilation systems and air distribution systems
- Carryout HVAC system controls, control strategies, building automation systems (BAS) and energy management and optimization
- Apply energy efficiency measures for HVAC systems, energy-saving technologies, HVAC system maintenance and optimization and green building standards and certifications
- Identify the factors affecting indoor air quality, pollutant sources and their health effects and air filtration and purification systems
- Improve indoor air quality through ventilation strategies and apply load calculation and system sizing
- Employ HVAC system installation best practices, commissioning process, testing and balancing procedures and start-up and performance verification
- Implement preventive maintenance tasks for HVAC systems, troubleshooting, safety precautions during maintenance and repairs and documentation and record-keeping
- Recognize hydronic systems and types of air conditioning systems as well as apply ductwork design and installation

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 HVAC systems for HVAC technicians, mechanical engineers, facility managers, building contractors, building inspectors, energy auditors and architects.

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.

Course Fee

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.

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. Faysal Eliyan, PhD, MSc, BSc, is a **Senior Engineer** with extensive years of experience within the **Oil & Gas**, **Petroleum** and **Refinery** industries. His expertise widely covers in the areas of **Concrete Structural Design**, **Concrete Maintenance & Reliability Analysis**, **Civil Engineering** Drawings, Standards & Codes, **Civil Engineering** Design, Petrochemical Plant Structure Design & Remediation, Elements of **Applied Civil Engineering**, **Dynamic Analysis of Rotating Equipment** Foundations **& Structural Steel Piperacks**, **Concrete & Structural Steel Design**, **Steel Structure Design**, Advanced **Building Construction Technology**, **Structural Engineering** Techniques, **Structural Renovation of Buildings**, **Earthwork & Structural Maintenance**, **Surface Drainage**, **Drainage System**, **Building Envelopes & Finishes**, **Landscaping & Roofing** System, **Seismic Design** for Buildings, **AutoCAD**, Advanced **Seismic & Wind Design of Reinforced Concrete**, **Structural** Systems & Components, Design of **Concrete Columns & Beam Frames**, Design of **Foundations & Equipment Footings**, **Maintenance of Concrete Structure**s, **Structural Reliability Assessment**, **Codes & Structural Reliability**, Probabilistic Evaluation of Existing Structures, **Structural Steel**, **Precast Concrete** and **Reinforced Polymer Layered Steel**. Further, he is also well-versed in **Gas Turbines**, **Steam Turbines, Heat Exchangers** Inspection, Testing & Overhaul Cleaning, Heating, Ventilation & Air Conditioning (**HVAC**), **Fans & Blowers**, **Heaters** & **Boilers**, **Compressors**, **Maintenance Planning & Scheduling**, **Pumps & Compressors** Operation & Maintenance, **Valves Technology** Selection, Installation & Troubleshooting, **Cooling Towers**, **Rotating Equipment**, **Turbomachinery**, **Condition Monitoring** & **Diagnostics**, **Hydraulic** & **Pneumatic Systems** Maintenance & Troubleshooting, **Piping Systems**, **Corrosion Control** & **Materials Selection** in Oil and Gas and Water Systems, **Machinery Alignment** & **Balancing**, **Maintenance Management**, **Operational Problems & Failure Analysis**, **Energy Performance Assessment** of **Powerplants**, **Plant Operations**, **Project Management**, **Six Sigma** and **Health**, **Safety** & **Environment**.

During his career life, Dr. Faysal has gained his practical and field experience through his various significant positions and dedication as the **Assistant Professor**, **Senior Consultant**, **Laboratory Instructor**, **Lecturer**, **Tutor**, **Mentor**, **Advisor**, **Trainer**, **Engineering Manager**, **Senior Engineer**, **Senior Project Engineer**, **Engineer** and **Adjudicator** from various institutions and universities such as the Community College of Qatar, American University of the Middle East, McMaster University, The University of British Columbia, The University of British Columbia, Qatar University and General Electric, just to name a few.

Dr. Faysal has **PhD**, **Master's** and **Bachelor's** degree in **Engineering** from the **University of British Columbia** (**Canada**). He is a **Certified Instructor/Trainer**, a member of the **Chamber of Civil Engineers**, **Structural Stability Research Council**, **American Institute of Steel Construction** and **American Society of Civil Engineers** (**ASCE**), **USA**. He also **published numerous books**, **researches** and **scientific papers** and received several awards and recognitions for **Journal of Materials Engineering and Performance** and has further delivered numerous trainings, courses, seminars, workshops and conferences internationally.

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 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 – 0930	***Introduction to HVAC Systems*** *HVAC (Heating, Ventilation, and Air Conditioning) Systems • Importance of HVAC Systems in Residential, Commercial, and Industrial Buildings • Basic Principles of Heat Transfer and Thermodynamics • Components of an HVAC System: Heating Units, Cooling Units, Air Handlers, Ductwork, and Controls*
0930 – 0945	*Break*
0945 – 1100	***Heating Systems*** *Types of Heating Systems: Furnaces, Boilers, Heat Pumps • Heat Generation and Distribution Methods • Energy Sources for Heating: Gas, Oil, Electricity • Heating System Components: Burners, Heat Exchangers, Fans, and Controls*
1100 – 1215	***Cooling Systems*** *Types of Cooling Systems: Air Conditioners, Chillers • Refrigeration Cycle and its Components: Compressors, Condensers, Expansion Valves, Evaporators • Refrigerants and their Environmental Impact • Cooling System Controls and Maintenance*
1215 – 1230	*Break*
1230 – 1330	***Ventilation Systems*** *Importance of Ventilation in Maintaining Indoor Air Quality • Natural Ventilation vs. Mechanical Ventilation • Ventilation System Components: Fans, Ductwork, Air Filters • Ventilation Rates and Standards*
1330 – 1420	***Air Distribution Systems*** *Types of Air Distribution Systems: Ducted Systems, Ductless Systems • Ductwork Design and Layout • Airflow Calculations and Balancing • Air Registers, Diffusers, and Grilles*
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 – 0930	***Controls & Automation*** *HVAC System Controls: Thermostats, Sensors, Actuators • Control Strategies: On/Off Control, Proportional Control, PID Control • Building Automation Systems (BAS) • Energy Management and Optimization*
0930 – 0945	*Break*
0945 – 1100	***Energy Efficiency & Sustainability*** *Energy Efficiency Measures for HVAC Systems • Energy-saving Technologies: Variable Speed Drives, Heat Recovery Systems • HVAC System Maintenance and Optimization • Green Building Standards and Certifications*
1100 – 1215	***Indoor Air Quality*** *Factors Affecting Indoor Air Quality • Pollutant Sources and their Health Effects • Air Filtration and Purification Systems • Ventilation Strategies for Improving Indoor Air Quality*
1215 – 1230	*Break*
1230 – 1330	***Load Calculation & System Sizing*** *Load Calculation Methods • Factors Influencing Heat Gain and Heat Loss in Buildings • Sizing HVAC Equipment Based on Load Calculations • Equipment Selection and Efficiency Considerations*
1330 – 1420	***Installation & Commissioning*** *HVAC System Installation Best Practices • Commissioning Process and its Importance • Testing and Balancing Procedures • Start-up and Performance Verification*
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 – 0930	***Maintenance & Troubleshooting*** *Preventive Maintenance Tasks for HVAC Systems • Troubleshooting Common HVAC Problems • Safety Precautions during Maintenance and Repairs • Documentation and Record-keeping*
0930 – 0945	*Break*
0945 – 1100	***Hydronic Systems*** *Hydronic Heating and Cooling Systems • Components of Hydronic Systems: Boilers, Pumps, Piping, and Valves • Balancing and Zoning in Hydronic Systems • Maintenance and Optimization of Hydronic Systems*
1100 – 1215	***Air Conditioning Systems*** *Types of Air Conditioning Systems: Central Air Conditioners, Split Systems, Packaged Units • Air Distribution in Air Conditioning Systems • System Controls and Refrigerant Charging • Troubleshooting Common Air Conditioning Issues*
1215 – 1230	*Break*
1230 – 1330	***Ductwork Design & Installation*** *Ductwork Design Principles: Pressure Losses, Air Velocity, Duct Sizing • Duct Materials and Insulation • Duct Sealing and Leakage Testing • Airflow Measurement and Balancing Techniques*

1330 – 1420	***Building Energy Management Systems*** *Building Energy Management Systems (BEMS) • Components and Functionality of BEMS • Energy Monitoring and Optimization through BEMS • Integration of HVAC Systems with BEMS*
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*

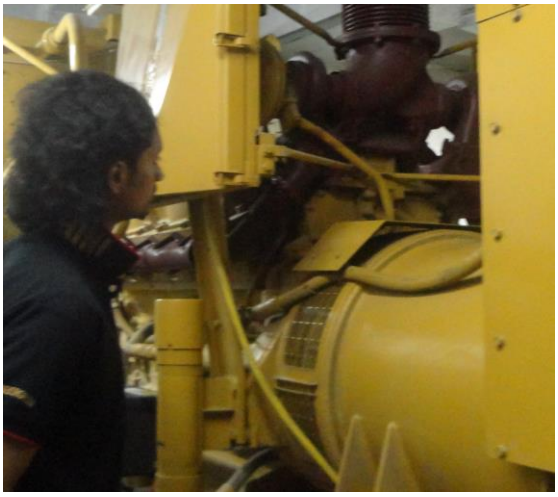
Day 4

0730 – 0930	***Advanced HVAC Technologies*** *Emerging Trends in HVAC Technology • Energy-efficient HVAC Equipment and Systems • Smart HVAC Controls and Connectivity • Integration of Renewable Energy Sources with HVAC Systems*
0930 – 0945	*Break*
0945 – 1100	***Retrofitting & Upgrading HVAC Systems*** *Assessment of Existing HVAC Systems • Energy-saving Opportunities in Retrofit Projects • Upgrading and Optimizing HVAC Equipment • Financial and Environmental Considerations in Retrofitting*
1100 – 1215	***Energy Auditing & Performance Evaluation*** *Energy Auditing • Energy Audit Process and Methodologies • Performance Evaluation of HVAC Systems • Energy-saving Opportunities through Audits*
1215 – 1230	*Break*
1230 – 1330	***Refrigerants & Environmental Considerations*** *Environmental Impact of Refrigerants • Transitioning to Low-GWP (Global Warming Potential) Refrigerants • Refrigerant Management and Leak Detection • Compliance with Regulations and Standards*
1330 – 1420	***HVAC System Controls & Integration*** *Advanced Control Strategies for HVAC Systems • Integration of Multiple HVAC Systems • Communication Protocols and Interfaces • Demand Response and Load Management*
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*

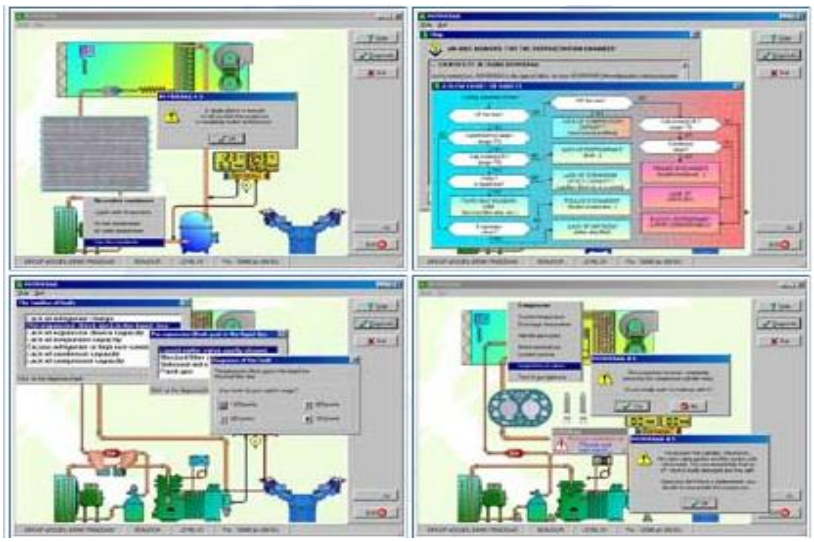
Day 5

0730 – 0930	***Commissioning & Retro-commissioning*** *Commissioning Process for New HVAC Systems • Retro-commissioning of Existing HVAC Systems • Performance Testing and Verification • Continuous Commissioning for Ongoing Optimization*
0930 – 0945	*Break*
0945 – 1100	***Energy Codes & Standards*** *Energy Codes and Standards related to HVAC Systems • ASHRAE Standards and Guidelines • Compliance Requirements and Certification Programs • Impact of Energy Codes on HVAC System Design and operation*
1100 – 1215	***Maintenance & Service Contracts*** *Importance of Regular Maintenance for HVAC systems • Components of a Maintenance Plan • Service Contracts and Agreements • Troubleshooting and Repair Procedures*
1215 – 1230	*Break*
1230 – 1300	***Building Automation & Control Systems (BACS)*** *Building Automation and Control Systems • Integration of HVAC Systems with BACS • Remote Monitoring and Control Capabilities • Energy Optimization through BACS*
1300 – 1345	***HVAC System Life Cycle Analysis*** *Life Cycle Assessment (LCA) of HVAC Systems • Environmental Impact of HVAC System Components • Evaluating Energy Consumption and Emissions • Designing for Sustainability and Life Cycle Cost Analysis*
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*

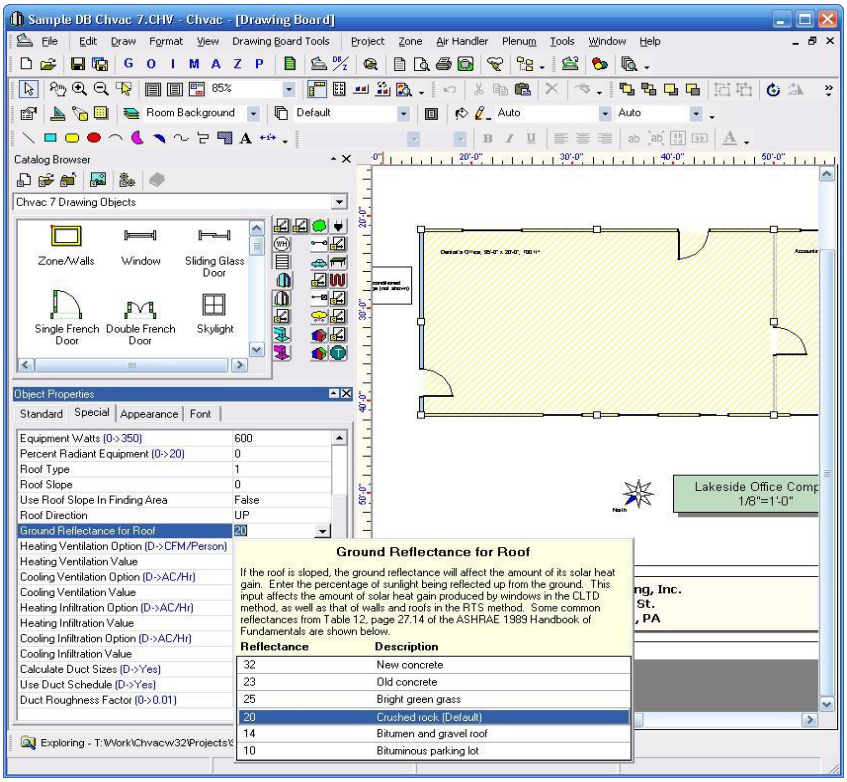
Practical Sessions/Site Visit



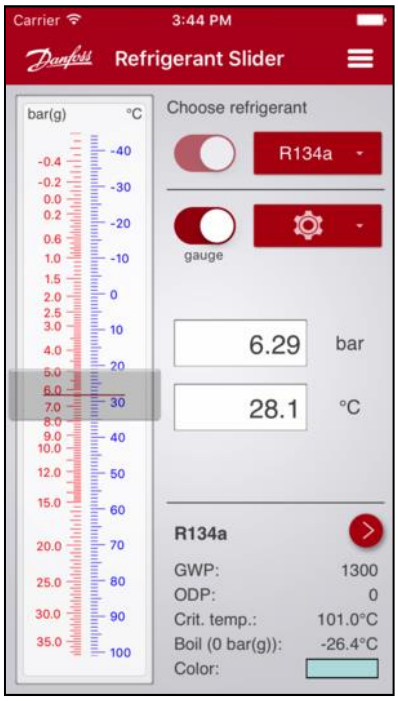
Simulator (Hands-on Practical Sessions)



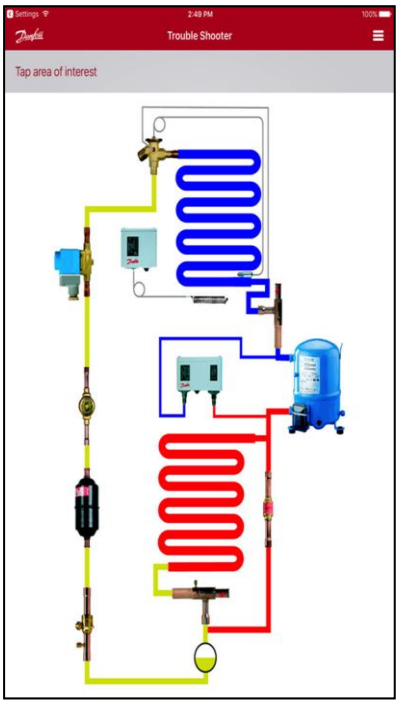
KOTZA HVAC Simulator



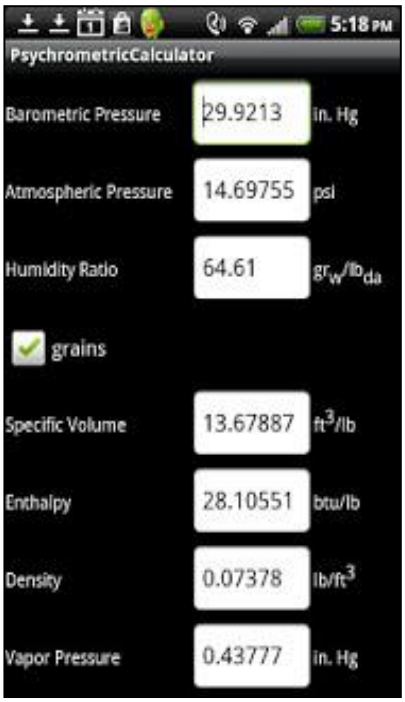
Elite CHVAC Simulator



Danfoss Refrigerant Slider App



Danfoss Trouble Shooter App



Air Lite Psychrometric Calcs

Course Coordinator

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