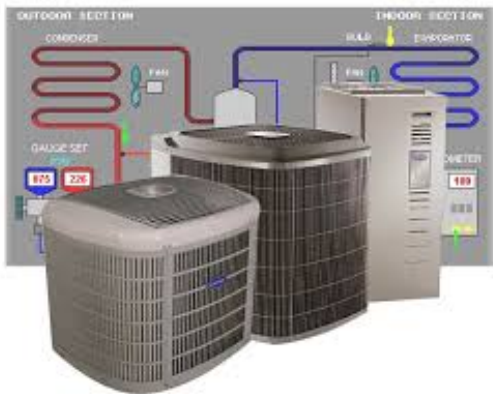

PRACTICAL FUNDAMENTALS OF HEATING, VENTILATION AND AIRCONDITIONING (HVAC) FOR ENGINEERS AND TECHNICIANS



YOU WILL LEARN HOW TO:

- Maintain and troubleshoot HVAC systems
- Understand and apply the psychrometric chart
- Design for good air quality
- Perform basic load calculations
- Initiate an effective inspection and maintenance program
- Minimise 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
- Outline the technologies available for the efficient energy management using HVAC systems

WHO SHOULD ATTEND:

- Maintenance engineers, technicians and staff
- Plant engineers
- Operation, maintenance, inspection and repair managers, supervisors and engineers
- Mechanical engineers and technicians
- Design engineers
- Electrical engineers and technicians
- Consulting engineers

The Workshop

This workshop is designed for engineers and technicians from a wide range of abilities and backgrounds and will provide an excellent introduction to the fundamentals of heating, ventilation and air-conditioning. 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 air-conditioning systems. Numerous tips and tricks throughout the course make it very practical and topical to your applications.

Pre-requisites

Fundamental knowledge of basic mechanical plant and operation thereof.

Practical Sessions

This is a practical, hands on workshop enabling you to work through practical exercises which reinforce the concepts discussed.

To gain full value from this workshop, please bring your laptop/notebook computer.

The Program

INTRODUCTION TO HVAC

- General
- Principles of thermodynamics
- Laws of thermodynamics
- Fundamentals of heat transfer
- Fundamentals of fluid flow
- Temperature and its measurement
- Pressure and temperature relationship

PSYCHROMETRY

- Introduction to psychrometry
- The properties of air
- Psychrometric charts
- Air conditioning and psychrometric systems
- Psychrometric charts as a tool for analysis for a/c performance

REQUIREMENTS OF COMFORT AIR CONDITIONING

- Thermodynamics of the human body
- Air purification methods
- Role of clothing
- Temperature and humidity in high heat load
- Inside and outdoor design criteria
- Ventilation and ventilation standards
- Design of ventilation systems
- Air distribution systems
- Air diffusion and performance
- Air purification methods

HEATING AND COOLING LOAD CALCULATION PROCEDURE

- Design considerations
- Load components
- Design criteria – indoor and outdoor
- Heat/load components
- Miscellaneous heat sources
- Fresh air loads
- Design of air-conditioning systems
- Heat gains: transmission, solar, infiltration

HVAC SYSTEMS

- All air, all water, air water systems
- Heat systems
- Steam heating systems
- Electric heat systems
- Components of the air conditioning systems in practice

CONSTANT VOLUME SYSTEMS

- System concepts
- Different configurations

VARIABLE AIR VOLUME SYSTEMS

- System concepts
- Different Variable Air Volume (VAV) systems

DUCT DESIGN, AIRFLOW AND ITS DISTRIBUTION

- Pressure gradient diagrams
- Duct sizing and design

INSULATION OF AIR-CONDITIONING SYSTEMS

- Properties of insulating materials
- Factors affecting thermal conductivity
- Heat transfer through insulation
- Economical thickness of insulation
- Insulated systems
- Importance of relative humidity for the selection of insulation

AIR-CONDITIONING EQUIPMENT

- Packaged units
- Split systems
- Chillers
- Boilers
- Pumps
- Cooling towers
- Adiabatic coolers
- Capacity assessment and selection
- Air filters
- Humidifiers
- Dehumidifiers
- Fans and blowers
- Grills and registers

REFRIGERATION

- Methods of refrigeration
- Air refrigeration systems
- Vapor compression and absorption refrigeration systems
- Refrigerants
- Refrigeration equipment

CONTROLS AND INSTRUMENTATION

- Definitions
- Sensors and elements
- Pneumatic and hydraulic controls
- Electrical and electronic controls
- Two position control
- PID control
- Parameters to be controlled (temperature supply and return air)

TYPICAL CONTROL SYSTEMS

- Preheat and humidification control (winter air-conditioning)
- Cooling, dehumidification and reheat control (summer air-conditioning)
- Face and by-pass control
- All year round air-conditioning system
- Zone control system

INSTALLATION, COMMISSIONING OPERATION, TESTING AND MAINTENANCE

- HVAC equipment
- Duct work and air outlets
- Electrical and controls
- Insulation and commissioning process
- Other service operations
- Economics
- Operational activities

- Do's and don'ts

FAULT FINDING AND TROUBLESHOOTING FAULTS

- Improper adjustments and settings
- Poor design and installation
- Equipment failure
- Limitations in operation
- Troubleshooting tools

TROUBLESHOOTING TOOLS (ELECTRICAL AND MECHANICAL)

- DOE (Design Of Experiments)
- FTA (Fault Tree Analysis)
- Cause and effect diagrams

GREEN HOUSE EFFECT AND FUTURE REFRIGERANTS

- Applications
- Smart buildings

ENERGY CONSERVATION AND ENERGY MANAGEMENT

- Costs of fuels
- Typical rate schedules
- Effects on total fuel bill
- Cost-in-use
- Energy performance
- Contracts and incentive programs

SUMMARY, OPEN FORUM AND CLOSING