PEDAS TEHNOLOGIES-
Institute of Research& Design
(An IIT-Delhi Alumni Startup)

# COURSE DETAILS

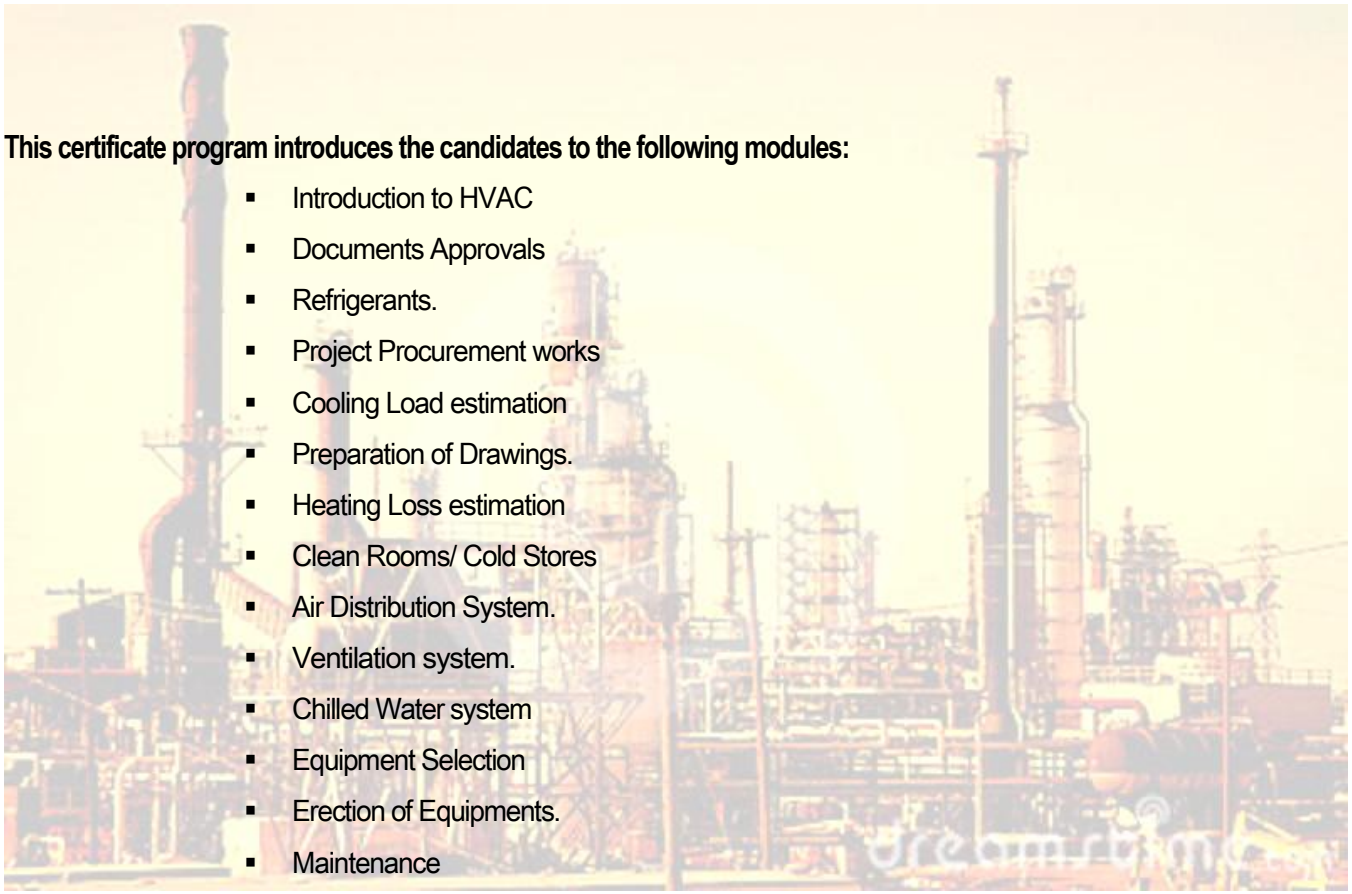
# FOR

# HVACDESIGN ENGINEERING

**CERTIFICATION & PG DIPLOMA COURSES FOR** Oil & Gas / Chemicals/ Energy & Power industries.

# Course Outline

The training program deals with fundamentals, designing, drafting, erection, estimation, maintenance & detail engineering of Central HVAC systems including Central Air Systems & Chilled Water Systems. The dedicated training sessions covers detailed applications & usage of codes &standards ASHRAE, ISHRAE, SMACNA, ASME, ARI, DW 142 and more.



**This certificate program introduces the candidates to the following modules:**

- Introduction to HVAC
- Documents Approvals
- Refrigerants.
- Project Procurement works
- Cooling Load estimation
- Preparation of Drawings.
- Heating Loss estimation
- Clean Rooms/ Cold Stores
- Air Distribution System.
- Ventilation system.
- Chilled Water system
- Equipment Selection
- Erection of Equipments.
- Maintenance
- Estimation of Projects.

I. Introduction to HVAC

- Scope of HVAC Industry with overview of Consulting & Constructionindustry.
- Concept of Air conditioning systems.

- Codes & Standards
- Principles of air conditioning
  - Vapor compression cycle
  - Absorption Chilling system
- Air conditioning systems
  - Local cooling comfort System
    - Window Air conditioning
    - Split Air conditioning
    - Multi Split Air conditioning
    - Chilled water Fan coil unit
  - Centrally air conditioned system
    - Central Air Conditioning System
    - Chilled water system.
- Psychometric chart
    - Properties of Air (DBT, %RH, WBT, HR, DPT, ENTHALPY)
  - Components of AHU & its functioning
    - Cooling
    - Heating
    - Humidification Methods
    - Dehumidification Methods
    - Filtration

II. Refrigerant

- Types of refrigerant
- Evaporating &condensing propertiesof refrigerant.
- Refrigerant Pipe sizing methods

III. Cooling& Heating load estimation.

- Basics of Heat transfer in a buildingenvelop.
- Understanding of Outdoor & IndoorConditions.
  - Correction to Outdoor temperature & Indoor temperature requirements

- Exposure of Wall, Latitude of Location, Yearly Range, Daily Range& etc.
- Factors affecting the loads estimate.

- Sources of Heat Gain
  - External- Sun Gain through Glass/Window, Sun Gain through Roof/Wall, Partition gain
  - Internal - People, Lights, Electrical Equipments, Motors, Kitchen Appliances, Heat gain through Infiltration air, Heat gain thorough Ventilation & By-pass air, Heat gain through ducts. Calculating ESHF, GTH, ADP, Dehumidified CFM.

- Heat loss calculations
  - Basics of Heat loss in a building envelop.
  - Sources of Heat loss -
    - Heat loss through Glass/window
    - Heat loss through Roof/Wall
    - Heat loss through Partition Glass/wall/Floor/slab
    - Heat loss through Infiltration air/Ventilation air & Bypass air
    - Heat loss through slab on Grade

IV. Design of Air Distribution System.

- Components of Air distribution system.
  - Types of Ducts, Duct Fittings, Dampers, Types of Diffusers, RAG, Flexible Duct,Flexible Connector, End Cap, Sound Attenuator etc.
  - Duct Elbows selections (Long radius, Short radius- No throat, Throat elbows,with heel radius, throat radius & radius of elbow).
  - Vanes location & number of vanes required
  - Duct Material Calculation- GI sheet, Total sheet required in kgs. Gauge of duct & Thickness of Gauge. Hanger Spacing, Hanger Rod Diameter and Angle supportSize.
  - Duct designing methods.
    - Velocity reduction method.
    - Equal friction Method.
    - Static regain method.
  - Fan selection & Static pressure calculation.
  - Supply & Return Duct configuration, Assigning Velocity of Air (FPM) to each Section of Supply and Return Duct Low Velocity system, Medium Velocity System and High Velocity System.
  - Components of Air Distribution System, Supply and Return Duct configurations (Extended Plenum Systems, Radial System, Trunk and Branch system)
  - Stair Well Pressurization System Designing

V. Design of Ventilation system.

- Introduction to Ventilation system,
  - Components of Ventilation system.

- Restaurant and Residence Kitchen Ventilation System Design
    - Sizing of Hood, Number of filters required & Duct designing.

VI. Chilled Water system design.

- Introduction to Chilled water system, Hot water system.
- Classification of chillers
    - As per Evaporator.
    - As per Condenser.
    - As per compressor.

- Chiller arrangements, Cooling tower arrangement, Types of cooling tower &Expansion tank connections.
- Pumps required in Chilled water system
    - Production Pumps
    - Distribution Pumps
    - Pump Classifications.

- Chilled water system pipe designing
    - Piping fundamentals
        - Pipe designators, piping standards.
        - Piping fittings and its Components.
        - Valves used in Chilled water system
    - Chilled water and Hot water GPM calculation.
    - Calculation of Water Velocity FPS on Suction and Discharge side of Pump.
    - Hydraulic Design for Sizing the Pipe for Amount of Flow.( Open& Closed PipingSystems).
    - District Cooling System.
    - Friction loss calculation for the piping system
        - Friction loss in straight pipes.
        - Friction Loss in Fittings.
        - Valves used in Chilled Water System.
        - Friction Loss in Valves & Special components.
    - Calculating TDH for Pump (Open Piping System and Closed Piping System).
    - Pipe Sizing Manual Method Hazen-Williams Equation for Calculating Friction Loss.
    - Pump Cavitations & NPSH Calculation for Pump.

VII. Equipment Selection

- AHU & FCU classification and selection.
- Package Unit Selection DX- Chiller Selection.
- Condenser Selection (Air cooled, Water Cooled, Evaporative).
- Cooling Tower Selection Mixed Air Temperature Calculation.
- HRF for Open and Closed Compressor.
- Expansion Tank Selection

VIII. Erection of Equipment's

- Detailing & Installation of Chillers
- Detailing & Installation of Air handling units.
- Detailing & Installation of Package units.
- Detailing & Installation of Fan coil units.
- Detailing & Installation of Condensing units

IX. Estimation of Project

- Understanding the tendering requirements
- Quantity take off
- Preparing Inquiry for Suppliers & Finalizing the suppliers.
- Final Billing & Quotations finalization

X. DocumentsApprovals

- Preparation of Material submittals,
- Shop drawing submittals,
- Types of approval.
- Preparation of BOQ and design documents,
- Specifications.

XI. Project Procurement works

- identifying the critical equipments
- preparation of purchase orders
- Letter of Intent
- Letter of credit
- Minutes of meeting

XII. Drafting of HVAC Systems-

- Introduction to Drafting,
- Types of Drawings used in the industry
- Study & Preparation of
  - Floor Drawings,
  - Roof Drawings,
  - Sectional Drawings
  - Builders Work Drawings
  - Co- ordination Drawings &Riser Diagram
  - Abbreviations & Symbols used.