

Competency Certificate in HVAC Design & Drafting

Course Outline

1. Introduction to HVAC system

2. Working of an air conditioner

- a. Reverse adiabatic cycle
- b. Evaporator
- c. Compressor
- d. Condenser
- e. Expansion valves or capillary tubes
- f. Thermostat

3. Types of compressors used in HVAC

- a. Reciprocating Air Conditioner Compressor
- b. Scroll AC Compressor
- c. Screw AC Compressor
- d. Rotary Air Conditioning Compressor
- e. Centrifugal Air Conditioning Compressor

4. Refrigerants used in Heating and Cooling system

- a. Basics of Thermodynamics
- b. Heat transfer
- c. Sensible heat
- d. Latent heat
- e. Psychrometric chart
- f. Dry bulb temperature
- g. Wet bulb temperature
- h. Relative humidity
- i. Humidity ratio
- j. Dew point

5. Heating and Air Conditioning Load calculation

I. Using E-20 form:

- a. Solar gain
- b. Transmission gain
- c. Equivalent temperature difference
- d. U values
- e. Bypass factor
- f. Ballast factor
- g. Infiltration
- h. Fresh air requirement calculation using ASHRAE 62.1 standards(10min)
- i. Tons of refrigerant
- j. CFM

II. Using HAP software

- a. Introduction to HAP Software
- b. To create weather properties
- c. Space creation in HAP
- d. System creation in HAP
 - i. Cav
 - ii. Vav
- e. Zone creation
- f. To create schedules for various application
- g. Occupant density calculation from ASHRAE 62.1 standard
- h. Duplicating the spaces
- i. Editing the spaces

6. Equipment selection

Types of Heating and Air Conditioning systems

- a. DX system
- b. VRF/VRV System
- c. Package units
- d. Roof top units
 - i. Chiller system
 - ii. Air cooled chillers
 - iii. Water cooled chillers

7. Air distribution system

- i. Air terminals
- ii. Introduction to air terminals
- iii. Manual calculation for diffusers
- iv. Manual calculation for grills
- v. Software calculation for air terminals
- vi. Selection of collar dampers
- a. Ducting
 - i. Introduction to Ducting system
 - ii. Standards used for duct design
 - iii. Duct sizing methodology
 - iv. Duct types
 - v. Duct sizing criteria
 - vi. Manual calculation for duct sizing
 - vii. Software calculation for duct sizing
 - viii. Selection of sheet metal gauge using SMACNA standards
 - ix. Calculating the overall duct weight
 - x. Static pressure calculation in ducting system
- b. Damper selection
 - i. Need for dampers in HVAC system
 - ii. Damper sizing
 - iii. VCD
 - iv. Fire damper
 - c. Duct supports
 - d. Insulation
 - i. Thermal insulation
 - ii. Acoustic insulation
 - iii. Under deck insulation

8. Variable Refrigerant Flow

- a. Introduction to VRF system
- b. Difference between single compressor and dual compressor system
- c. Piping design for VRF system

9. Hydronic Heating and Cooling

- a. Open loop system design**
 - i. Water requirement
 - ii. Pipe sizing
 - iii. Finding the critical path
 - iv. Friction loss or head loss calculation
 - v. Pump capacity
- b. Closed loop system Design**
 - i. Water requirement
 - ii. Pipe sizing
 - iii. Friction loss or head loss calculation
 - iv. Pump capacity

10. District Heating and Cooling

- a. Introduction to district heating and cooling
- b. Why district heating and cooling
 - I. General components
 - II. Centrifugal Pumps
 - III. Motors, Motor Controls,
 - IV. Variable-Frequency Drives
 - V. Pipes, Tubes, and Fittings
 - VI. Valves
 - VII. Heat Exchangers

11. Cold storage design

12. Ventilation design

- a. Need for ventilation
- b. Types of ventilation

13. Toilet ventilation

- a. Residential
- b. Commercial buildings
- c. Public bathrooms
- d. Exhaust air calculation
- e. Fresh air calculation

14. Commercial kitchen ventilation

- a. Hood types from ASHRAE 154
- b. Hood design from ASHRAE 154
- c. Exhaust air calculation
- d. Fresh air calculation

15. Car parking ventilation

- a. Exhaust air calculation
- b. Fresh air calculation
- c. Car parking smoke ventilation

16. Stair Case pressurization

17. Green HVAC

18. HVAC Designer check list

19. Preparing bill of quantity

Competency Certificate
in
Electrical Design & Drafting
Course Outline

1. Introduction to Electrical Design

- ✓ Basics of Electrical power system
- ✓ Overview of Generation Transmission and distribution System
- ✓ Power transmission fundamentals
- ✓ Why electrical in MEP Design?
- ✓ Standards – NBC,IEC,IS,NEC,DEWA,ADEWA, NEMA.
- ✓ Selection of luminaries
- ✓ Calculating number of luminaries using RELUX software
- ✓ Exporting from RELUX to Autocad 2D
- ✓ Exporting from RELUX to excel
- ✓ Practical example on RELUX interior lighting design

2.Understanding Building Orientation

- ✓ Introduction to architectural Layouts
- ✓ Different types of false ceiling
- ✓ Work plane
- ✓ Brief introduction to elevation view

3.Luminare Calculation

- ✓ Introduction to lighting system
- ✓ Lamps and luminaries types
- ✓ Concepts of lighting design
- ✓ Selection of lux for lighting design
- ✓ Room index calculation
- ✓ Calculating COU for lighting design
- ✓ Manual calculation for interior lighting
- ✓ Manual calculation for exterior lighting
- ✓ Manual calculation for emergency lighting
- ✓ Practical example on lighting design

4.RELUX software for interior lighting

- ✓ Introduction to RELUX software
- ✓ Step by step Importing AutoCAD file to RELUX
- ✓ Creating scenes for interior lighting design
- ✓ Editing project scenes in RELUX software
- ✓ Diversity factor calculation
- ✓ Applying for approval to service provider(BES COM,TNEB,BRPL & more)
- ✓ Thumb rule calculation

5.RELUX software for exterior lighting

- ✓ Introduction to exterior lighting
- ✓ Selection of luminaire for exterior lighting
- ✓ Basics of street lighting design

6. DIALUX software for interior lighting design

- ✓ Introduction to DIALUX software
- ✓ Difference between RELUX and DIALUX
- ✓ First lighting system design
- ✓ Second lighting system design
- ✓ DIALUX bathroom design
- ✓ Emergency lighting design
- ✓ Interior lighting design using blue icon in DIALUX
- ✓ Practical example on DIALUX software

7. DIALUX software for exterior lighting design

- ✓ Selection of luminaire for exterior lighting in DIALUX
- ✓ Basics of street light design
- ✓ Basics of playground lighting
- ✓ Playground lighting design

8. Approval for power supply from service provider

- ✓ To estimate the total connected load (w or kw)
- ✓ To calculate the total demand (w or kw)
- ✓ Selection of cables
- ✓ De-rating current calculation
- ✓ Cable sizing
- ✓ Bus bar sizing
- ✓ Selection of cable insulation
- ✓ Voltage drop calculation (VD)

9. Power Network design

- ✓ Power flow from distribution to appliances
- ✓ Importance of circuits
- ✓ Circuit types
- ✓ Light circuit design
- ✓ Power circuit design

10. Power network Distribution

- ✓ Importance of phase distribution
- ✓ When to select single phase and three phase system
- ✓ Load distribution to each phase
- ✓ Balancing 3 phases

11. Power network protection

- ✓ Introduction to Circuit Breakers
- ✓ Properties and Types of Circuit Breakers
- ✓ Difference between circuit breakers and isolators
- ✓ Circuit breaker selection
- ✓ Power system design with ELCB
- ✓ Short circuit current calculation

12. Panel board design

- ✓ Introduction to panel boards
- ✓ Panel board wiring
- ✓ Selection of panel board
- ✓ Types of panel boards
- ✓ Panel board sizing

13. Wires and Cables

- ✓ Introduction to wires and cables
- ✓ Types of cables
- ✓ Difference between cables and wires
- ✓ Need for earthing in power system
- ✓ Types of earthing
- ✓ Earthing pit designing
- ✓ Earthing system design
- ✓ Earthing cable sizing

14. Conduits and cable tray

- ✓ Conduit types
- ✓ Conduit sizing
- ✓ Calculating with spacing factor
- ✓ Different types of cable tray
- ✓ Cable tray sizing
- ✓ Trench design

15. Transformer selection

- ✓ Brief introduction to transformers
- ✓ Types of transformers
- ✓ Types of transformer connection
- ✓ Transformer sizing (kva)
- ✓ HT yard design

16. DG design

- ✓Need for a DG
- ✓Working of DG
- ✓Synchronizing DG to Power System
- ✓DG Sizing methods
- ✓Calculating diesel requirement
- ✓Diesel tank sizing

17.Power factor improvement

- ✓Why power factor to be improved?
- ✓Difference between reactive power and real power
- ✓Need for reactive power
- ✓Capacitor bank sizing
- ✓Implementation of capacitor bank

18.Electrical secondary protection systems

- ✓Sizing the PV modules
- ✓Inverter sizing
- ✓Battery sizing using DOD values
- ✓Solar charger controller sizing

19.Lightning protection

- ✓To calculate the total coverage area
- ✓Materials used for lightning protection
- ✓Lightning protection design
- ✓Lightning arrestor calculation
- ✓Termination of lightning protection

20. Solar energy

- ✓Introduction to solar Energy
- ✓Advantages and disadvantages of PV cells
- ✓Can I install solar panels by myself?
- ✓Off-grid solar system
- ✓Determine power consumption demand load

21.Basics of Etap medium voltage network design

- ✓Short circuit current calculation
- ✓Voltage drop calculation

22.UPS System

- ✓Need for an UPS
- ✓Synchronizing UPS with power system
- ✓Inverter sizing
- ✓Battery sizing

23. Power system control and operation

- ✓ATS system
- ✓MTS System
- ✓Tap changers

Electrical drafting using AutoCAD

1. Understanding civil layouts

- ✓ Introduction and area calculation
- ✓ Main walls and Partition walls
- ✓ Stair case
- ✓ Doors and Hinges
- ✓ Dimensions
- ✓ Elevation view and section views
- ✓ Plotting

2. 2d Electrical Schematic

- ✓ Introduction
- ✓ Legends creation – part 1
- ✓ Legends creation – part 2
- ✓ Legends creation – part 3
- ✓ Legends creation – exercise
- ✓ Panel creation
- ✓ Enclosures and name plates
- ✓ Inserting panel boards to project

3. Implementing legends in project

- ✓ Light sockets
- ✓ Power sockets
- ✓ Ceiling fans
- ✓ Exhaust fans
- ✓ Air Conditioner points

4. Buses representation in 2D

- ✓ Drafting light circuit layouts
- ✓ Drafting power circuit layouts
- ✓ Light and power circuit routing
- ✓ Cable tray routing
- ✓ Conduits routing
- ✓ Supports for conduits and cable tray

5. Electrical panels

- ✓ Join
- ✓ Panel creation
- ✓ Enclosures and name plates
- ✓ Inserting panel boards to project

6. AutoCAD lightning design

- ✓ Creation of horizontal conductors
- ✓ Creation of vertical conductors
- ✓ Creating grids
- ✓ Down comers

7. Earthing design

- ✓ Earthing pit design
- ✓ Creating pipes
- ✓ Creating the arc offsets
- ✓ Filletting
- ✓ Trimming

8. Plotting

- ✓ Scaling the project
- ✓ Plot method 1
- ✓ Plot method 2
- ✓ Exporting project to different formats

9. Electrical template creation

- ✓ Editing the title block
- ✓ Adding tables
- ✓ Adding legends

Software's used in training: RELUX, DIALUX, AutoCAD, ETAP and Excel

Competency Certificate
in
Plumbing Design & Drafting
Course Outline

1. Introduction to Plumbing System

- ✓ Plumbing standards
- ✓ Piping materials
- ✓ Valve types
- ✓ Common sanitary
- ✓ Fixtures Fittings

2. Plumbing Formulas

- ✓ Reynolds Number
- ✓ Chezy's equation
- ✓ Darcy's equation
- ✓ Hazen Williams formulas

3. Cold Water supply in buildings

- ✓ OHT capacity UGT capacity
- ✓ Drain pipe size for water tank
- ✓ Over flow pipe size for water tank
- ✓ Minimum number of required plumbing fixtures
- ✓ WSFU & minimum fixture branch pipe size
- ✓ Conversion of WSFU to GPM

4. Water pipe sizing

- ✓ Equivalent pipe length for valves & fittings
- ✓ Required terminal pressure in appliances
- ✓ Flow rates and loading units
- ✓ Plumber's chart
- ✓ Equivalent pipe size

5. Hot Water supply in buildings

- ✓ Hot water system
- ✓ Hot water demand per fixture

6. Auto-Pneumatic system

- ✓ Introduction to auto-pneumatic system
- ✓ Pneumatic system design
- ✓ Sizing vertical and horizontal tanks

7. Fountain system

8. Gardening system

- ✓ Gardening water irrigation system
- ✓ Pump capacity

9. Plumbing for high rise building

- ✓ Water management system
- ✓ Terrace loop sizing

10. Plumbing drainage system

- ✓ Minimum internal diameter for sanitary appliances
- ✓ Fixture units for different sanitary fixtures
- ✓ Maximum number of discharge units allowed in stack
- ✓ Vent pipes
- ✓ Drainage tank system Septic tank system

11.Manholes

- ✓Capacity of grease interceptors
- ✓Size of manhole
- ✓Dispersion trenches

12.Storm Water

- ✓Rain fall intensity(mm/hr)
- ✓Runoff coefficient
- ✓Sizing of rain water pipes for roof drain
- ✓Rain water available from Roof top harvesting
- ✓Air vent pipe sizing

13.Sewage Water Treatment plant

- ✓Introduction to Sewage
- ✓Water Treatment plant Working of STP
- ✓STP Design

in
Fire Fighting Design & Drafting

Course Outline

1. Introduction to Fire Fighting

- a. Requirement of fire fighting
- b. Standards – NEFA, NBA
- c. Understanding hazardous of the building
- d. Classification of fire fighting of the system
- e. Building Classification

2. Fire Fighting for High Rise Buildings

- a. Standards
- b. Selection of rise
- c. Sprinkler system
- e. Foam system
- f. Gas suppression system
- g. Helipads

3. Fire Extinguisher

- a. Introduction to fire extinguisher
- b. Classification of fire
- c. Types of fire extinguisher

4. Gas Suppression System

- a. Fm 200
- b. Requirements for gas suppression system
- c. Software for fm 200 calculation

5. Foam System

- a. Need for foam system
- b. Foam system calculation
- c. Types of foam
- d. Cleaning agents (AFFF)

6. Foam Alarm Control Panel

- a. Active system
- b. Passive system
- c. Heat detectors
- d. Smoke detectors
- e. Manual call points
- f. Zoning

7. Minimum Fire Fighting Requirement for High Rise Buiding

- a. Introduction to Sprinkler
- b. Working of sprinkler system
- c. Hydronic calculation (Water calculation)
- d. Deluge systems

8. Staircase Pressurization System