

Name: ID Ref: Batch Start Date:

Training Course: CERTIFICATE COURSE IN HVAC DESIGN Course Duration: 3 MONTHS

| Date | Training Course Syllabus | Signature |
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| UNIT – 1 : Introduction to HVAC | | |
| 1. | <ul style="list-style-type: none"> ▪ Basic concepts & Fundamentals of HVAC, Scope of HVAC system & services, ▪ Standards & codes used in HVAC | |
| UNIT – 2 : HVAC Systems & its components | | |
| 2. | <ul style="list-style-type: none"> ▪ Basics of Heating, Ventilation & Air conditioning system. ▪ Basics of refrigeration system (Vapour compression & Vapour absorption) | |
| 3. | <ul style="list-style-type: none"> ▪ Function & types of Compressors, Condensers, Expansion valves & Evaporators. ▪ Accessories used in refrigeration system. ▪ Air handling system & its major components. | |
| UNIT – 3 : Air conditioning system | | |
| 4. | Window air conditioning system <ul style="list-style-type: none"> ▪ Working principle of window AC with line diagram. ▪ Application, advantages & disadvantages Split/De-centralised air conditioning system <ul style="list-style-type: none"> ▪ Working principle of split A/C system with line diagram ▪ Type of Split A/C (DX system/Ducted split unit) ▪ Application, advantages & disadvantages of split AC system. | |
| 5. | <ul style="list-style-type: none"> ▪ Working principle of VRF/VRV system with block diagram. ▪ Types of VRF system & its Refrigeration cycle. ▪ VRF system design with Refrigerant pipe sizing. | |
| 6. | Packaged Air conditioning system <ul style="list-style-type: none"> ▪ Working principle of Packaged A/C system with line diagram. ▪ Types of Packaged A/C system (Air cooled/Water cooled packaged unit) ▪ Point load estimation & selection of vibration isolators. | |
| 7. | Central Air conditioning system <ul style="list-style-type: none"> ▪ Working principle of Central plant A/C system with line diagram. ▪ Various system used in central A/C system (Air system, water system & Refrigeration system) | |
| 8. | <ul style="list-style-type: none"> ▪ CAV & VAV air system. ▪ Types of Central A/C system (Air cooled & water cooled) | |
| UNIT- 4 : Major Components of Central Air conditioning system. | | |
| 9. | Chiller <ul style="list-style-type: none"> ▪ Working principle of chiller based on refrigeration cycle. ▪ Types of chiller based on condensing unit & compressor. ▪ Advantage & Disadvantages of Air cooled v/s water cooled chiller ▪ Working principle of Vapour Absorption chiller. | |
| 10. | Boiler. Cooling tower (Working principle & Types of cooling tower). Primary & Secondary chilled water pumps. | |
| 11. | Expansion tank, Air Handling units (AHU & FCU). Air Terminals (Function, types & selection of air terminals) | |
| UNIT - 5: Air distribution system | | |
| 12 | <ul style="list-style-type: none"> ▪ Duct definition & Terminology ▪ Duct fittings & Accessories used for ducting system. ▪ Duct design consideration | |

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| 13. | <ul style="list-style-type: none"> ▪ Duct design methods & Duct sizing as per Aspect Ratio (AR) ▪ Finding duct size using Duct-sizer. | |
| 14. | <ul style="list-style-type: none"> ▪ Exercise for Duct design. | |
| 15. | <ul style="list-style-type: none"> ▪ Ducting quantity take-off & Cutting list preparation. ▪ Gauge selection for sheet metal, Bill of material for Ducting network | |
| 16. | <ul style="list-style-type: none"> ▪ Selection of Diffusers, Registers & grills. ▪ Duct material & Insulation material used in HVAC industry. | |
| 17. | <ul style="list-style-type: none"> ▪ Study of ducting drawings. | |
| 18. | <ul style="list-style-type: none"> ▪ Duct routing – Preparation of Single Line Diagram (SLD) | |
| 19. | <ul style="list-style-type: none"> ▪ Preparation of Final duct layout – Double line diagram (DLD) as per SMACNA standards. ▪ Opening for ducts passing through wall/slab. | |
| 20. | <ul style="list-style-type: none"> ▪ Preparation of sectional drawing & duct support. | |
| 21. | <ul style="list-style-type: none"> ▪ Exercise on complete air distribution system design. | |
| UNIT-6 : Chilled water piping system (Hydronic system) | | |
| 22. | <ul style="list-style-type: none"> ▪ Classification of chilled water piping system ▪ Pipe sizing for chilled water system | |
| 23. | <ul style="list-style-type: none"> ▪ Fitting & Valves used in HVAC piping system ▪ Function of Valves | |
| 24. | Study of piping drawings. | |
| 25. | Pipe routing – Preparation of Single Line Diagram (SLD) | |
| 26. | <ul style="list-style-type: none"> ▪ Preparation of Final Piping layout – Double line diagram (DLD). ▪ Preparation of Piping Schematic diagram. | |
| 27. | Preparation of sectional drawing & pipe support. | |
| 28. | Exercise on complete piping design. | |
| UNIT-7 : Heating/Cooling Load Calculation. | | |
| 29. | <ul style="list-style-type: none"> ▪ Basic concept of heating & cooling load & its sources. ▪ Building survey for heat load calculations. | |
| 30. | Finding Temperature Difference (ΔT), ETD (ΔT_e) & U-Factor for Wall, Roof, Glass & Partitions. Finding Ventilation requirements for IAQ. | |
| 31. | Step wise heat load calculation as per E-20 format (Manually) | |
| 32. | Calculations for ESHF, ADP & Air flow rate (CFM). | |
| 33. | Exercise on Heat load calculation (Manually). | |
| 34. | Exercise on Heat load calculation (Manually). | |
| 35. | Heat load calculation using Excell sheet based on E-20 Format. | |
| UNIT-8 : Study of Psychrometric chart. | | |
| 36. | <ul style="list-style-type: none"> ▪ Psychrometric properties of air: DBT, WBT, DPT, ADP, RH, Enthalpy, Humidity Ratio, Specific Volume. | |

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| | <ul style="list-style-type: none"> Psychrometric Processes (Sensible Heating/Cooling, Latent Heating/Cooling, Heating & Humidification, Heating & De-humidification, Cooling & Humidification, Cooling & De-humidification). | |
| 37. | <ul style="list-style-type: none"> Finding Values using chart (ADP, SHF, on/off coil temperature, Enthalpy, Specific volume & Humidity ratio etc) Cooling load calculation using psychrometric chart | |
| 38. | Exercise on Psychrometric chart. | |
| UNIT-9 : Duct Static Pressure calculations | | |
| 39. | <ul style="list-style-type: none"> Basic concept of duct static pressure. External Static Pressure (ESP) calculation using excel sheet. | |
| 40. | Exercise on ESP calculation. | |
| 41. | Exercise on ESP calculation. | |
| 42. | Theoretical Motor HP calculation, Selection of Fan speed (RPM) | |
| UNIT-10 : Pump head calculation. | | |
| 43. | Pump Head Calculations | |
| 44. | Exercise on Pump head calculation. | |
| 45. | Selection of chilled water pumps. | |
| UNIT-11 : Equipment Selection & Schedule preparation. | | |
| 46. | Selection of Air conditioning equipment (Chiller, AHU, FCU, Pumps, Fans, Air terminal) | |
| 47. | Schedule preparation for all HVAC equipment. | |
| UNIT-12 : Study of Drawings | | |
| 48. | Design/Tender/Contract drawing, Shop drawing | |
| 49. | Co-ordination drawing, As-built drawing | |
| 50. | Section drawing, Detailed drawing | |
| UNIT-13 : Project Estimation: | | |
| 51 | <ul style="list-style-type: none"> Understanding the Tender requirements. Preparation of BOQ (Bill of Quantity) | |
| UNIT-14 : Fire Protection & Control system. | | |
| 52. | <ul style="list-style-type: none"> Basic concepts of Fire alarm system, Control system (DDC) Building Management system (BMS) and interference with HVAC equipment. | |
| Live project work training: | | |
| 1 week duration | <p>Cooling/Heating load calculation, system design, equipment schedule preparation, design layout, ESP calculation & Equipment selection for various type of projects as below.</p> <ul style="list-style-type: none"> Simple residential building. Office Building. High rise residential tower. | |