

# GUJARAT TECHNOLOGICAL UNIVERSITY

## M.E Semester: 2

### Mechanical Engineering (Thermal Engineering)

**Subject Name:** ADVANCED AIR CONDITIONING

Sr. No.	Course Content
1.	Psychometric charts : ASHRE and CARRIER charts ,their differences ,application of corrections of different charts Applied Psychrometry : Combinations of different processes and their representation on psychrometric charts, psychrometric calculations for cooling and dehumidification .High latent heat load ,dehumidified air quantities based on total and effective room loads ,GSHF and ESHF ,effect of fan and duct heat gain or dehumidified air quantity ,effective surface temperature ,effect of bypass factor on GSHF, analysis for using all outside air ,psychrometric of partial load control
2.	Cooling tower: Different types, construction working performance, testing different types of desert coolers, testing of desert coolers as per BIS, Air washer, different types, construction performance.
3.	Heat gain calculations: choices of supply conditions. Solar heat gain: Terminology calculation different solar angles ,relation between different angles ,calculation of the intensity of direct ,diffused and ground radiation solar air temperature ,empirical methods to evaluate heat transfer through walls, and roofs, TETD and its determination by calculation and tables ,Heat gain through glass ,Solar heat gain factor, use of equations and tables ,shading of glass ,solar chart and its use .shading of glass ,solar chart and its use, shading devices and its selection ,load due to other sources, stack effect ,different methods of calculating cooling load as per ASHRE-some brief idea(other than TETD methods)
4.	Duct Design : Types of ducts ,duct construction ,factors affecting duct construction, friction charts and other correction factors ,losses ,design velocity and its selection, duct heat gain or loss ,duct insulation ,duct layouts, duct sizing methods, equal friction static regains and T-method design simple idea .Noise and their isolation, duct materials and their accessories

5.	Air Distribution: Terminology, outlet performance, types of outlets, location of outlets ,factors affecting grill performance, selection of outlets using nomographs ,tables and line charts ,room air diffusions, performance index (ADPI) and its use in outlet selection ,use of different equations.
6.	Air conditioning systems :Factors affecting the selection of the systems, classification, systems, design procedure, system features, psychrometric analysis, controls of all air, air water, all water, DX ,VAV and dual duct systems basic idea of cold air distributions systems and dessicant cooling systems
7.	Thermal effects :-Human thermo regulation, different equations governing thermal exchanges, factors affecting comforts, environmental indices, AQ and its importance –Human comfort and health.
8.	Air conditioning controls : Characteristics of HVAC noise ,Acoustical rating systems and criteria ,RC ,NC, and NR criteria for noise rating ,noise control methods for VAV units ,cooling towers, air devices roof top units ,chillers ,pumps ,AHU rooms, compressors.
9.	Air handling systems : Fans ,types ,construction performance characteristics ,fan laws ,testing as per BS ,IS and AMCA standards, fan selection with the help of tables charts and curves, fan drive arrangements and discharge from fans, duct design fan selection etc.
10.	Advances in Air Conditioning, Clean Room Concept, Filtration of suspended particles, PPM Control and methods, Types of Filters, Mechanical , UV filters etc.

**List of Experiments:**

1. Study of advanced air conditioning system.
2. To study various instruments used in air conditioning
3. Study of air conditioning test rig and to plot various processes.
4. Study of clean room and to plot time v/s temperature curve.
5. Study of different types of fans used in air conditioning.
6. Performance and analysis on Air Conditioning system with different psychrometric conditions.

7. Design of air conditioning system and load calculation for residential & commercial buildings.
8. Design of air distribution system and design optimization of ducting.
9. Study of 15 TON water chilling plant.
10. Study and testing of ductable split A / C plant of a conference hall of main building of Parul Institute.

**Reference Books:**

1. Air Conditioning Engineering -By Jones 5th 2001
2. Thermal Environmental Engineering, Threlkeld
3. Hand book of air conditioning systems design :carrier corporation 1965
4. Air conditioning principles and systems –pita
5. HVAC testing adjusting and balancing manual :Gladstone 3 rd 1997
6. Ashrae Data Book, (1) Fundamentals (2001) (2) application (1999) (3) System and equipments (2000)
7. Hand book of air conditioning and refrigeration : wang 2 (1993)
8. Air conditioning application and design by jones 2nd1997
9. Air conditioning system design manual : lorach1993
10. Fan handbook :bleier 1998