
1. Module details

Module name

HVAC LOAD ESTIMATING

Nominal duration

One and half module

It is anticipated that students will achieve the competencies specified in 56 to 60 hours.

Module codes

EA134

Discipline code

2. Module purpose

The aim of this module is to provide the student with the necessary knowledge and skills to carry out a building survey and load estimate for a commercial building using a proforma and computer aided software.

3. Prerequisites

EA135 - Applied Psychrometrics
EA146 - Introduction to Air Conditioning

4. Relationship to competency standards

TBA

5. Content

1. Heat flow in buildings
 - conduction
 - convection
 - radiation
 - heat paths
2. Thermal storage.
3. Different methods of calculations
 - ASHRAE
 - Carrier
 - finite difference
4. U Values.
5. Film coefficients.
6. Solar heat
 - direct
 - diffuse
 - sol air temperature
 - sun position calculations
7. Design conditions
 - outdoor
 - monthly/daily corrections
 - comfort/critical

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- indoor
 - effective temperature
8. Thermal comfort.
 9. Space characteristics.
 10. Equipment location.
 11. Zoning.
 12. Internal loads
 - lighting
 - equipment
 - people
 - load profiles
 - internal partitions
 13. Fresh air/AS 1668
 14. Calculation of fabric loads
 - walls
 - roofs
 - floors
 15. Windows
 - glass types and factors
 - shade factors
 - internal and external shading
 - shading from adjacent structures
 16. Air quantity calculation
 - psychrometrics
 - by-pass factor
 - coil load
 - VAV air quantities
 17. Piping and other losses.
 18. Refrigeration plant load.
 19. Equipment selection
 - coils
 - air handling
 - chillers/boilers
 20. Fresh air preconditioners.
 21. Fresh/exhaust air heat exchangers.
 22. Computer software
 - responsible use

6. Learning outcome details

Learning outcome 1

On the completion of this module, the learner will be able to:

Complete a series of worked examples on detailed calculations associated with estimating air conditioning loads in buildings.

Assessment criteria

- 1.1 Calculate U values for various wall/roof constructions.
- 1.2 Calculate Sun Azimuth and Altitude angles.
- 1.3 Calculate thermal mass for various room configurations.
- 1.4 Calculate infiltration rates.
- 1.5 Calculate overall shade factors for various windows.

Learning outcome 2

Complete a detailed air conditioning cooling and heating load estimate for commercial building with at least 5 zones using a manual computation method at sufficient time intervals to determine the plant peak design capacities.

Assessment criteria

- 2.1 Determine design conditions from specification and tables.
- 2.2 Calculate heat flows through the building fabric taking account of thermal storage.
- 2.3 Calculate heat flow through windows taking account of internal and external shading.
- 2.4 Calculate infiltration and fresh air ventilation rates.
- 2.5 Determine internal and system heat gains.

Learning outcome 3

Complete a detailed air conditioning heating and cooling load estimate for commercial building using a computer software package.

Assessment criteria

- 3.1 Complete all performance criteria as for learning outcome 2 using an industry accepted computer software program.
- 3.2 Investigate at least 3 design options to reduce the air conditioning loads established in 1` and comment on the cost implications of adopting these options.
- 3.3 Assuming an all air system is to be installed, determine equipment size including coil and air handling unit capacities for constant and variable volume systems and central refrigeration and boiler plant capacities.
- 3.4 Prepare a brief report comparing the manual and computer methods.

**7. Assessment
Strategies**

**8. Module Delivery
Strategies**

**9. Resource
Requirements**

Assignments.

AIRAH Application Manual DA9, Air Conditioning Load
Estimation & Psychrometers

Trane Air Conditioning Manual

ASHRAE Handbooks

AS1668

SMCNA 1987 HVAC Systems Applications

Stoeker W.F. Jones J.W. 1982, Refrigeration and Air Conditioning,
McGraw-Hill

AIRAH Transactions Wooldridge MJ The Prediction of Building
Thermal Performance AIRAH Journal Dec. 1970

EU Guidelines on Ventilation

Software

Trane

PMV

Mitsubishi