

ME 432

Principles of Air Conditioning and Refrigeration

Text-Book: **Heating Ventilating and Air Conditioning – Analysis and Design** by F. C. McQuiston, J. D. Parker, and J. D. Spitler; 6th Edition, John Wiley & Sons, 2005, ISBN: 0-471-47015-5

Prerequisites: Thermodynamics, Fluid Mechanics, and Heat Transfer

References: **Principles of Heating Ventilating and Air Conditioning** by R. H. Howell, H. J. Sauer, Jr., and W. J. Coad; ASHRAE, Inc, 1998

ASHRAE Handbook – Fundamentals, ASHRAE, Inc, 1997

Heating Ventilating and Air Conditioning – Analysis and Design by F. C. McQuiston, J. D. Parker, and J. D. Spitler; 4th Edition, John Wiley & Sons, 1994

Heating and Cooling of Buildings – Design for Efficiency by J. F. Kreider and A. Rabl; McGraw-Hill, 1994

Week	Content & Chapter(s)	Assignments
1	Introduction (Chaps 1&2); Refrigeration cycles (Chap 15)	HW 1 (8 problems)
2	Refrigeration cycles (cont.); Psychrometrics (Chap 3)	
3	Psychrometric processes (Chap 3)	HW 2 (8 problems)
4	Psychrometric cycles (Chap 3)	
5	Indoor air quality (Chap 4)	-
6	Quiz 1; Heat transmission in buildings (Chap 5)	HW 3 (8 problems)
7	Solar radiation & Windows (Chap 6)	
8	Solar radiation & Windows (cont.)	HW 4 (8 problems)
9	Space heating load (infiltration/exfiltration) (Chap 7)	
10	Cooling loads (Chap 8)	-
11	Quiz 2; Energy calculation methods (Chap 9)	HW 5 (8 problems) Project due!
12	Fans, pump & piping design (Chap 10, Chap 12)	
13	Project Presentation	-
14	Review; Preparation of Final Exam	-

Term Project of ME432

Teamwork:

- (1) Two (2) students per team or an individual student.
- (2) Define each student's role in the project (about 50% each).
- (3) Project grade is based on the overall quality of project and each student's contribution to the project.

Detailed Requirements:

- (1) Define your project (**air-conditioning—cooling**), including:
 - i) background and conditions, such as room (location, wall and roof facing direction; window; door); vehicle (window; body material)
 - ii) human (number, activity, human comfort condition)
 - iii) environmental concern (particulate or gaseous pollutant control)

(20% marks)

- (2) Cooling load calculation, including:
 - iv) Heat transmission through wall;
 - v) Solar radiation through window;
 - vi) Infiltration;
 - vii) Heat generation, including human factors

(40% marks)

- (3) Minimum fresh air requirement based on environmental concern, including
 - vii) by-pass factors;
 - viii) filter efficiency and location;
 - ix) selection of filters with pressure drop consideration

(20% marks)

- (4) Air-conditioning unit requirement, including:
 - x) return air ratio (based on minimum fresh air required) and mass flow rate;
 - xi) cooling coil capacity and SHR;
 - xii) compressor capacity with a selected refrigerant (e.g., R134a)

(20% marks)

- (5) Energy cost (not required)

(10% mark – bonus – No bonus if overall grade has already reached 100% marks)