ME 434 REFRIGERATION AND AIR CONDITIONING

Credit: 3(3-0-6) **Semester 1 Year 2009**
Prerequisite: ME 332 Heat transfer

Instructor: Chainarong Chaktranond Section: 0200
Room 413, Tel.(ext.) 3144 ,
E-mail address: cchainar@engr.tu.ac.th
Lecture time: Tue & Thru, 9.30 – 11.00 (Room Eng. 612)
Consulting hours: Tues 13.30 – 16.00 or make an appointment via email

Objectives: Students are expected to

- Understand basics of refrigeration and air condition systems and their operations
- Have ability to compute the cooling load
- Have ability to design and to select refrigeration and air conditioning equipments

Course Description:

Review of thermodynamics principles. Fundamental of heat and mass transfer. Theoretical and actual vapor compression cycles. Psychometrics chart. Refrigerants. Main components: compressor, condenser, evaporator, expansion valves. Refrigerants. Cooling load calculation for refrigeration and air conditioning systems. Air conditioning system design. Design of air duct and air distribution.

Teaching Schedule:

Session	Topics
1	**1. Introduction to refrigeration and air conditioning systems.** Overviews and importance of refrigeration and air conditioning system for Mechanical engineer.
2	**2. Reviews of thermodynamics and heat transfer** 1st and 2nd laws of thermodynamics; open – close systems; control volume; heat transfer coefficient and thermal resistance in various shapes
3 – 4	**3. Vapor compression cycle** Theoretical and actual vapor compression cycle; Refrigeration Carnot cycle; Refrigeration effect and capacity; Coefficient of performance; Limited temperature
5	**4. Psychrometry** Psychrometric chart; Definitions and calculations of humidity ratio and relative humidity; Air and water vapor properties (Calculation & Table)
6 – 7	**5. Wetted – surface heat transfer** Wet surface phenomena; heat and mass transfer on wet surface of cooling coil
8 – 10	**6. Cooling and Dehumidifying coils** Calculation of actual cool coil; Dehumidify
11 - 12	**7. Main equipments in Refrigeration system** Functions and types of main equipments - Evaporator, compressor, condenser, pressure reducing valve, thermostat, sight glass, drier – filter and safety equipments.
13 – 14	**8. Refrigerant** Types , properties and applications of refrigerants; Selecting refrigerants
*15 – 17	**9. Cooling load calculation for refrigeration system** Types of heat gain, cooling load and calculations; Selecting capacity of refrigeration equipment.

Session	Topics
18 – 19	**10. Air conditioning system** Objectives of air conditioning; Requirements in air conditioning design; Categories of air conditioning systems; Selecting suitable air conditioning system; Thermal comfort
20 – 24	**11. Cooling load calculation for air conditioning system** Types of heat gain, cooling load and calculations; Selecting capacity of air conditioning equipment
25 – 26	**12. Air duct design** Bernoulli equation; Energy equation; Equivalent round duct diameter; Friction loss; minor losses; Air duct design - equal friction and static regain methods.
27 – 28	**13. Supply air distribution** Principles of air movement in air conditioning room; Types and functions of air diffusers; Selecting diffusers.

Material courses:

- Text book and Handout given by instructor (http://www.engr.tu.ac.th/~cchainar)

Reference Books:

1. Stoecker, W.F., 1982. Refrigeration and Air Conditioning 2nd ed., McGraw-Hill.
2. Dossat, R.J., 1991. Principles of Refrigeration. 4th ed., Prentice-Hall.
3. Edward G. Pita, 1998. Air conditioning principles and system, 3rd ed., Prentice-Hall.
4. Handbook of air conditioning system design, Carrier air conditioning company, McGraw-Hill
5. ASHARE handbooks

Grade policy:

Attendance, Quiz and Assignment	20%
Mid-term Examination (topic 1 – 6)	20%
2nd Examination (topic 7 – 9)	30%
Final Examination (topic 10 – 13)	30%
Total	100%

Evaluation

≥ 80	**A**
74 - 79	**B+**
68 – 73	**B**
62 – 67	**C+**
56 – 61	**C**
50 – 55	**D+**
44 – 49	**D**
< 44	**F**

Examination schedule: Mid term 28 Jul 2009 (9.00 – 11.00)
2nd exam will be announced
Final exam 1 Oct 2009 (9.00 – 12.00)