

ME 430 REFRIGERATION AND AIR CONDITIONING

Credit: 3(3-0-6)

Semester 1 Year 2014

Prerequisite: ME 331 Heat transfer

Instructor:

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Section: 750001

Lecture time:

Wed: 13.00 – 16.00 (Room Eng 712)

Consulting hours:

Thru 13.30 – 16.30 or make an appointment via email

Objectives: Students are expected to

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

Course Description:

Reviews of thermodynamics principles. Principles of refrigeration and various refrigeration systems. Single stage and two stages mechanical vapor compression refrigeration cycles. Main components such as compressor, condenser, evaporator, refrigerant flow control equipment. Auxiliary equipment. Absorption refrigeration. Refrigerants. Psychrometrics. Air conditioning system design. Introduction to current refrigeration and air conditioning technology. Cooling load calculation for refrigeration and air conditioning systems. Freezing of foods. Duct design. Principles of air distribution and diffuser selection.

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 1 st and 2 nd 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; Single and two stage vapor compression refrigeration cycles
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, Absorption refrigeration.
*15 – 17	9. Cooling load calculation for refrigeration system Types of heat gain, cooling load and calculations; Selecting capacity of refrigeration equipment, freezing of food.
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:

- ระบบทำความเย็นและปรับอากาศ, ไชยณรงค์ จักรธรานนท์, สำนักพิมพ์มหาวิทยาลัยธรรมศาสตร์ (02-564-2589-60)
- Handout given by instructor (<http://www.chainarong.me.engr.tu.ac.th>)

Reference Books:

1. Stoecker, W.F., 1982. Refrigeration and Air Conditioning 2nd ed., McGraw-Hill.
(For topic 2 – 6)
2. Dossat, R.J., 1991. Principles of Refrigeration. 4th ed., Prentice-Hall. (For topic 7 – 9)
3. Edward G. Pita, 1998. Air conditioning principles and system, 3rd ed., Prentice-Hall. (For topic 10 – 11)
4. Handbook of air conditioning system design, Carrier air conditioning company, McGraw-Hill.
(For topic 12 – 13)
5. ASHRAE handbooks

Grade policy:

Attendance, Quiz and Assignment	20%
Mid-term Examination (topic 1 – 6)	20%
2 nd 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